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State Herbarium of South Australia
PO Box 2732
Kent Town SA 5071
Australia



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***Eremophila tietkensii* F.Muell. & Tate (Myoporaceae), a misinterpreted species**

R.J. Chinnock

State Herbarium of South Australia,
Hackney Road, Adelaide, South Australia 5000
Email: chinnock.bob@saugov.sa.gov.au

Abstract

Although *Eremophila tietkensii* has been considered synonymous with *E. latrobei*, recent investigations have shown that it was misinterpreted and is a distinct species. The reasons for this misinterpretation are given and a description and notes on the species provided.

History

Recently, when finalising work on a loan from the National Herbarium of Victoria (MEL) of *Eremophila* before its return, I came across a specimen mixed in with a large number of *E. latrobei* specimens, which was quite different. There was affixed to the sheet one of Mueller's distinctive blue *Phytologic Museum of Melbourne* labels. In Mueller's handwriting was *E. tietkensii* and what appears to be in another hand "Central Australia, 1889". A small label with slits in it, which was obviously originally attached to the single branch portion, had written on it in pencil "Laura Vale, Beeton's Hills". This was a previously overlooked specimen. Since *E. tietkensii* had been considered a synonym of *E. latrobei*, someone, at some stage, placed the collection with specimens of this species.

Tietkens was part of an expedition exploring and prospecting in the MacDonnell Ranges and presumably after the expedition the plant specimens were given to Professor Tate who then forwarded duplicate material to Baron von Mueller. As no specimen of *E. tietkensii* (sensu Mueller) is held at the State Herbarium of South Australia (AD), Tate presumably forwarded the only material to Mueller. Mueller and Tate published an account of the plants, collected by Tietkens, in 1889 in the *Transactions of the Royal Society of South Australia*. Presumably Tate read the paper at the meeting, as was the custom at that time, to the Society members on April 1st 1890. In this paper, details of locations where Tietkens had collected were provided and the species listed by family. Six new species including *E. tietkensii* are formally described. Two locations, Laura Vale and Mt Sonder were listed for *E. tietkensii*. Interestingly, they actually listed seven species as new but one of them, *Eriocaulon graphiticum*, was never described in the paper nor elsewhere.

One might consider that since Smith had lectotypified on a Mt Sonder specimen, this would be the end of the

matter, however, from the specimens in AD and (MEL,) I believe that Tate and Mueller had different concepts of *Eremophila tietkensii*. Furthermore, I am of the opinion that accounts of new species in the paper were prepared entirely by Mueller in Melbourne and that Tate had not seen the Laura Vale specimen at least after it was forwarded to Mueller. Certainly by 1894 Tate considered *E. tietkensii* merely a form of *E. latrobei*. On one MEL sheet with two collections made by Tate in Central Australia at Illawarta (terete-leaved form) and Illpilla (broad-leaved form), Mueller had written on a label "*E. latrobei* var. = *E. tietkensii*". On another label associated with these collections he stated "This in my judgement is a canescent broad leaved state of *E. latrobei*".

Mueller certainly saw a specimen of "*E. tietkensii*" of Tate's broader concept collected by Tietkens at Mt Sonder and this specimen appears to me to be part of the same gathering as the AD collection labelled by Tate as *E. tietkensii*. Mueller, in his own hand, identified the specimen as *E. latrobei*. Thus Mueller had identified specimens collected by Tietkens at Mt Sonder as *E. latrobei* while Tate in Adelaide had identified them as *E. tietkensii*.

Mueller was the authority on *Eremophila* and by 1890, when he described *E. tietkensii*, he had already published accounts of forty-two new species, and in addition, one jointly with Augustus Oldfield (1859) and three species through George Bentham in *Flora Australiensis* in 1870, who attributed the species to him. His concepts of species in *Eremophila* were sound and he certainly knew *E. latrobei* very well. Mueller had previously described this species in 1859 and he had many specimens of this common plant at his disposal by 1889. He had Graff illustrate two variants in *Myoporinous Plants* (1886). He would not have included the two discordant elements from Laura Vale and Mt Sonder in the preparation of a description of a new species, especially since he knew *E. latrobei* so well,

and indeed had labelled his specimen from Mt Sonder as that species. I presume therefore that the reference to *E. tietkensii* from Mt Sonder was on the advice of Tate or, added by Tate when he received the paper from Mueller for presentation to the Royal Society.

With the Laura Vale specimen to hand, I have re-examined the protologue of *E. tietkensii* and conclude that the description was based entirely upon the Laura Vale specimen.

In the description of *E. tietkensii* provided in the paper, there are a number of important features given that indicate that it was based entirely on the Laura Vale specimen. Leaves are described as “elongate to narrow-lanceolar, entire but somewhat flexuose and gradually tapering to the apex, slightly decurrent into a rather conspicuous petiole”. The leaf size range is given as “two to three inches long” (50–75 mm), “half to two-thirds inches wide” (12.5–17 mm). In contrast, the material from Mt Sonder has linear leaves, abruptly tapering towards the apex and there is no well-defined petiole. Leaf size varies from 20–40 mm long and 1.5–2.5 mm wide. Leaf margins are entire, distinctly thickened and non-undulate in this particular case.

Another important feature mentioned which again indicates that Mueller based the species on the Laura Vale specimen is that the ovary is given as “imperfectly beset with glandular, very minute hairlets”. The ovary of *E. tietkensii* possesses this feature but *E. latrobei*, including the material from Mt Sonder, is glabrous.

Eremophila tietkensii F.Muell. & Tate has long been treated as a synonym of *E. latrobei* F.Muell., and when I published an account of the South Australian Myoporaceae in 1986, I followed Smith (1975) in placing the name in synonymy under *E. latrobei*. Smith lectotypified *E. tietkensii* upon a collection made by Tietkens on Mt Sonder, Northern Territory in 1889, held at Melbourne (MEL), and a duplicate of this collection held at the State Herbarium of South Australia, labelled *E. tietkensii* in Tate's handwriting, confirmed that it was indeed *E. latrobei*. Smith did, however, allude to a second collection made at Laura Vale in the Northern Territory, with leaves about 1.5 cm wide. As Mueller based his account of *E. tietkensii* on the single specimen from Laura Vale held at Melbourne, this specimen is treated as the holotype. The specimen from Mt Sonder, upon which Smith lectotypified *E. tietkensii* is not considered type material as it does not agree with the protologue. The reference to Mt Sonder for *E. tietkensii* in the paper by Mueller and Tate (1890), is presumed to have been added by Tate when he received the paper from Mueller, or by Mueller on Tate's authority.

Taxonomy

Eremophila tietkensii F.Muell. & Tate

Trans.Roy.Soc.South Australia 8: 109 (1890). — **Type:** Laura Vale, Northern Territory, [June] 1889, W.H. Tietkens s.n. (holotype: MEL 82820).

E. pachomai Chinnock ex Paczkowska & A.R.Chapman, W. Austral. Fl. Descr. Cat. 339 (2000), nom. inval. (manuscript name).

Rounded to flat-topped shrub 1–2 (–3) m tall with branches and leaves clothed in a persistent fine grey, appressed, tomentum of simple hairs. Leaves alternate, scattered, distinctly petiolate; petiole 6–12 mm long, lamina ovate to lanceolate, acute to attenuate, margins entire, surfaces smooth, (21–) 30–72 (–91) × (4–) 6–17 (–20.5) mm. Flowers 2–4 per axil, pedicellate. Sepals 5, imbricate, subequal, elliptic to oblanceolate, broadly acute to obtuse with a mucro, 7.5–12 (–15.5) × 1.5–6 mm, often enlarging after flowering and then veins prominent, broadly acute to obtuse with a mucro; outer surface pubescent or rarely almost glabrous, hairs appressed, eglandular and shorter erect glandular ones, margins very densely pubescent; pinkish-purple. Corolla 22–28 mm long, pale lilac to pale mauve or white tinged lilac, outer surface of lobes and tube with scattered appressed eglandular hairs; inner surface of lobes glabrous, tube woolly below lobes of upper lip and medial lobe of lower lip and around stamen bases; lobes obtuse. Stamens 4, included; filaments with long eglandular hairs towards base, glabrous above; anthers glabrous. Ovary ovoid-oblong, 4-locular with 2 ovules per locule, densely glandular-puberulous with scattered or numerous longer eglandular hairs; style eccentric, glabrous or with a few scattered simple eglandular hairs in distal part and glandular hairs at base. Fruit dry, woody, ovoid-conical more or less beaked, ribbed, 6–7 × 3–4.5 mm; exocarp adhering to endocarp, glandular-puberulous but usually with some longer eglandular hairs, occasionally resinous; endocarp vertically ribbed, splitting into 4 segments towards apex. Seed unknown.

Notes

Eremophila tietkensii is a very variable species widespread throughout Western Australia but extending just over the border into the Northern Territory. The occurrence at Laura Vale is consistent with the known distribution of this species.

Eremophila tietkensii is closely allied to *E. platycalyx* and *E. macmillaniana* but is easily distinguished from these species by having 2–4 flowers in the axils and numerous branches arising from near ground level. Commonly the corolla is pale lilac or white tinged lilac but very rarely it may be purple spotted on the outside. Although the leaves are typically long and lanceolate in form, very small ovate-leaved forms, which may represent a distinct subspecies, occur in the northern part of the species range east of the Great Northern Highway in the Great Sandy Desert.

Apart from the type collection, *E. tietkensii* has only recently been re-discovered in the Northern Territory. In October 2000, Peter Latz collected the species west north-west of Kintore and more recently in August 2003, David Albrecht and Peter Latz found it on the Brown's Bore–Kintore Track, south south-east of Johnstone Hill. According to David Albrecht (pers.comm. 2004)

the Laura Vale site is geographically between these two locations. All three locations are very close to the Western Australian border and it is unlikely that any collection was ever made at Mt Sonder, which is situated much further east.

Additional specimens of E. tietkensii cited

NORTHERN TERRITORY: *D.E. Albrecht & P.K. Latz 10477*, Browns Bore, Kintore track, c. c. 16 km SSE of Johnstone Hill, 17 Aug 2003 (AD); *P.K. Latz 17052*, 24 Oct 2000, 28 km WNW of Kintore (AD).

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**The botanical legacy of 1802:
South Australian plants collected
by Robert Brown and Peter Good on Matthew Flinders' *Investigator* and
by the French scientists on Baudin's *Géographe* and *Naturaliste***

R.M. Barker

State Herbarium of South Australia,
Hackney Road, Adelaide, South Australia 5000
Email: barker.robyn@saugov.sa.gov.au

Abstract

First collections of botanical material from South Australia were by the scientists on board the British and French vessels involved in mapping the South Australian coastline in 1802. A background to the collecting of plants and seeds and the illustrating of these plants is given, collecting localities are identified and the scientific outcomes of both voyages are discussed. A comprehensive list of plants collected in South Australia by the British and based on still extant herbarium collections is presented for the first time. A list of plants collected by the French is less comprehensive but their time collecting in South Australia was much more limited and predominantly confined to Kangaroo Island.

The first known plant collections from South Australian shores, for which herbarium specimens and botanical illustrations still exist, were made in 1802 by the scientific party on board Matthew Flinders' ship, the *Investigator*. Some months later, in early 1803, collections were also made by the French naturalists on board the *Géographe*, under the command of Nicolas Baudin. What was collected, where was it collected and where are the specimens now? Some two hundred years after the event it seems quite remarkable that such information about the British specimens has not been available until now and that the French collections are still largely undocumented.

The coming of the bicentenary of the voyage of Matthew Flinders prompted the completion of a number of projects concerning Robert Brown and Ferdinand Bauer. These were the publication of Brown's diary (Vallance et al. 2001), a monumental project which took some 15 years and involved a number of people, the production of a list of all of Ferdinand Bauer's Australian paintings (Mabberley & Moore 1999) and the databasing of the Brown specimens held in the Natural History Museum in London. Peter Good's diary had already been reproduced (Edwards 1981) and, with Matthew Flinders' account of the voyage (Flinders 1814), there are now three personal accounts of the British voyage which may be compared for detail of the South Australian experience.

Important, too, at that time were the production of a work on the part the French played in making Australian plants known in Europe (Jill, Duchess of Hamilton 1999), the availability of an English translation of

Baudin's diary (Cornell 1974) and a marked increase in the knowledge of the French expedition and its outcomes (Horner 1987; Bonnemains 2002).

South Australians had more to celebrate. They marked the chance meeting of the French and British voyages of discovery at Encounter Bay, South Australia, in 1802 by commemorating both expeditions in a myriad of community, organisational and institutional activities coordinated under the umbrella name *Encounter 2002*¹ (W.R. Barker 2002). Particularly important to the development of this paper was an exhibition *The Botanical Legacy of 1802* at the State Herbarium of South Australia, which was the only one devoted to the scientific aspects of the two expeditions (Symon 2002).

Background

By 1800 the outline of the Australian coast was mostly known apart from the southern area between the Nuyts Archipelago, near Ceduna, South Australia, and the east coast; this area was either depicted as a blank or, more commonly, by a fanciful depiction of a coastline which included Tasmania as part of the mainland (Clancy 1995). The southern coastline had been visited in 1627 by the Dutchman, Pieter Nuyts, in his ship the '*t Gulden Seepaert*'. Having been carried too far south by

¹ Relevant websites are: the National Library of Australia and partners (2002) documenting these celebrations under *Encounter 2002*; Art Gallery of South Australia (2002) where the exhibition *The Encounter, 1802* on the art resulting from the voyages is archived; and State Library of South Australia (2002) with links to numerous web resources as well as community activities.

² "Golden Seahorse" (Klaassen 2006).

the winds of the Southern Ocean after rounding the Cape of Good Hope, Nuyts made land in the neighbourhood of Cape Leeuwin in Western Australia. From here, he sailed along the southern coast for more than 1500 kilometres, this region gaining the name Nuyts Land. He eventually reached the islands of St Francis and St Peter, in what is now known as Nuyts Archipelago. This discovery seems to have been largely ignored by the Dutch in their maps of the time, but the southern coastline as far as these islands was depicted in a French map of 1663 by Melchisedec Thevenot; the name of Nuyts, his ship, and the date are included on the map (Clancy 1995).

It was not until the visits of Matthew Flinders in H.M.S. *Investigator* and Nicolas Baudin in the *Géographe* with her sister ship *Naturaliste* at the beginning of the 19th century that the rest of the South Australian coast line was to be officially mapped. That mapping resulted in the historical event that all South Australians are familiar with, the encounter of the two parties in Encounter Bay on 8–9 April 1802.

But the exercise of sending the ships to Australia was not just for mapping. As can be seen from the instructions issued to the two captains, the purpose of the voyage was just as much for investigation of the natural products of this unexplored land.

For the British sailing in the *Investigator*:

During the course of the survey, you are to use the tender under your command as much as possible; moving the *Investigator* onward from one harbour to another as they shall be discovered, in order that the naturalists may have time to range about and collect the produce of the earth, and the painters allowed time to finish as many of their works as they possibly can on the spot where they may have been begun ...

British Admiralty instructions to Matthew Flinders
(Flinders 1814)

and for the French in *Géographe* and *Naturaliste*:

All these countries, more or less new to us, present a vast field for geographical operations and for research of all kinds which can combine to perfect the natural sciences and increase the mass of human knowledge.

In order to carry out the government's design, Citizen Baudin will employ assiduously, and with all the zeal of which he has given proof, the scientists, engineers, artists and means placed at his disposal, as much to determine precisely the geographical position of the principal points along the coasts that he will visit and to chart them exactly, as to study the inhabitants, animals and natural products of the countries in which he will land. With regard to the products, he will give his attention to the collecting of those which appear capable of being preserved and he will apply himself principally to the procuring of the useful animals and plants which, unknown in our climate, could be introduced here.

*Comte de Fleurieu of the
Institut National to Citizen Baudin*
(reproduced in Cornell 1974)

Even the names of their ships reflected the desired outcomes from these voyages.

The scientific complement of the French ships

On board the French ships, Baudin, who had much experience in the collecting of plants, both in the Americas and in the East Indies (see below), had requested eight scientific staff. Instead he was to end up with twenty two – three botanists, five zoologists, two mineralogists, three artists, five gardeners, two astronomers and two geographers. Perhaps fortunately, after taking five and a half months to reach Île de France (Mauritius) from Paris, nine of the scientists left the expedition. Amongst those departing were the three official artists (see below) and the botanists Andre Michaux³ and Jacques Delisse on board the *Naturaliste*. Leschenault de la Tour, the botanist on board the *Géographe* with Baudin, remained. Also remaining were three gardeners (see below), together with Péron the zoologist and Lesueur and Petit, the unofficial artists of the voyage.

Leschenault de la Tour (1773–1826)

Leschenault de la Tour, the surviving botanist, accompanied the Baudin expedition for the whole of its Australian sojourn, only to be left ill in Timor in 1803 on the return journey to France. Leschenault spent some time on the *Naturaliste* and some on the *Géographe*, having initially embarked with Baudin on the *Géographe*. He apparently transferred to the *Naturaliste* on their first visit to Timor, but was back on the *Géographe* with Baudin after their sojourn in Port Jackson. While in Port Jackson in 1802, he spent a day botanising with Robert Brown and Peter Good (Vallance et al. 2001). He was the same age as Robert Brown who was impressed with his powers of observation. Baudin, on the other hand, was less impressed, apparently considering his friend, the gardener, Riedlé, to be a “better Botanist than the Gentleman at the head of this Department” (Vallance et al. 2001, p. 179). With his earlier experiences in plant collection in the Americas, Baudin would almost certainly have been more comfortable with the gardener's approach to collecting than that of the trained scientist in Leschenault.

³ Andre Michaux (1746–1803), republican, was an experienced French botanist and explorer who had been in Iran from 1782–85 and as the Kings Botanist in the fledgling United States of America from 1785–1796. His work in America has long been recognised by American botanists. There is a web site (www.michaux.org) devoted to his contributions to botany, a book about him (Taylor & Norman 2002) and an international symposium, named in his honour, was held in the Daniel Stowe Botanic Gardens, Belmont, North Carolina in May 2002. He was obviously more than qualified to accompany the Baudin expedition as a botanist and, no doubt recognising the already obvious problems with the expedition, left it at Mauritius to undertake a flora of Madagascar. According to Baudin (see Brown 2000, p. 90), Michaux left the expedition because he was “unwilling to surrender to the government the collections he would have made on the voyage”. There would undoubtedly be an element of truth in this, since Michaux had been sending plants back to France, in his own name, for many years. He died in Madagascar in 1803.

Despite Baudin's comments, Leschenault appears to have been an assiduous collector. There were numerous herbarium specimens returned to France, seventy large cases, according to one report (Cooper 1952), although it is difficult to put a number on these since, unlike Brown's, they have never been worked upon as a whole.

On his return to France in 1807, after spending time in Java and America, Leschenault, unlike Brown, did not embark on an account of the collections he had made, although he did produce an account of the vegetation (which included a description of Kangaroo Island vegetation). This account was published in Péron's account of the voyage (Péron & Freycinet 1807–16). Leschenault continued his travels as a naturalist, spending 1816 to 1822 in British India and then 1823 to 1824 in South America.

Robert Brown named the genus *Lechenaultia* after him. The omission of the 's' has caused confusion ever since, but Brown was not the only one to spell his name in this way. The Swiss botanist de Candolle, who started the first world flora while based in Paris in the 1820s, also omitted the 's' when naming *Hemistemma lechenaultii* DC. (now *Beyeria lechenaultii* (DC.) Baill.: Euphorbiaceae; de Candolle 1817) and *Cassia lechenaultiana* DC. (Caesalpiniaceae; de Candolle 1824).

The type of *Hemistemma lechenaultii* DC. is a Leschenault collection from St Peter Island in the Nuyts Archipelago (protologue reproduced in Fig. 1).

Baudin as a collector of plants

The scientific credentials of Nicolas Baudin are often overlooked. He was born in 1756 on the island Saint Martin de Ré (the quay of the town now bears his name), off the coast of France near the town of La Rochelle. Having initially worked with the French East India Company, he later joined the French Navy, this time coinciding with the American Revolution. Having been relieved of his command as an *officier bleu*⁴ by a group of *officiers rouges* (of the aristocrats), he resigned from the Navy. From 1787 to 1794, following his role in transporting Franz Boos (Gunn & Codd 1981) and his natural history collections from the Cape of Good Hope to Austria for the Emperor's garden at Schönbrunn, Baudin undertook at least three natural history voyages for the Austrian Government (Brown 2000). He made expeditions to the Indian Ocean and the Pacific Ocean collecting plants and animals, primarily for the Schönbrunn Palace gardens; all of these voyages ended in shipwreck and this may explain his later reluctance to land on the Australian coastline in any but already well-documented areas. On the last of these voyages in 1792–93 he again set off for the Indian Ocean in the third ship designated as *Jardinière* and was off the coast of New Holland in May 1793 when consecutive

⁴ An officer not of noble birth and, until 1791, having no prospect of higher rank, see Brosse 1983.

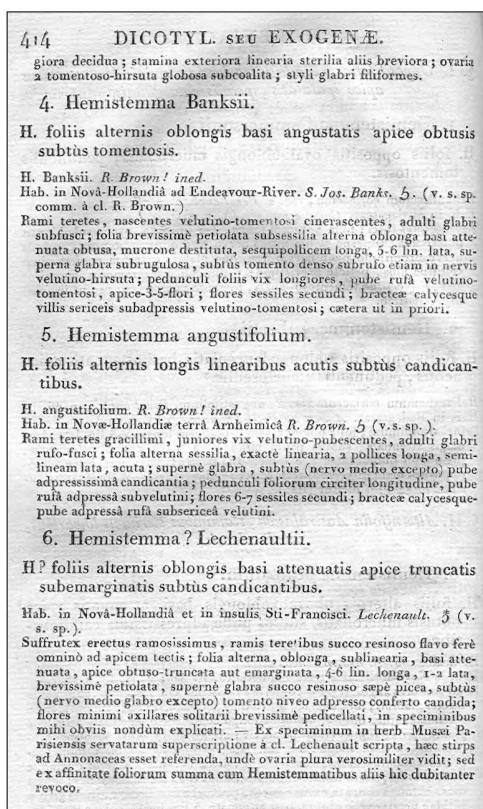


Fig. 1. Protologue (in Latin) for *Hemistemma lechenaultii* DC. (now *Beyeria lechenaultii* (DC.) Baill.) in de Candolle (1817). The plant was collected by Leschenault from St Peter's Island in the Nuyts Archipelago rather than St Francis Island as indicated (see Appendix 1). Note the spelling as "Lechenault" in the text.

hurricanes forced him to turn back (Brown l.c.). He put into Bombay, visited the Persian Gulf and the Red Sea, before returning to the Cape of Good Hope where he was shipwrecked in Table Bay. The collections on board were somehow relocated to Trinidad and, having now become unpopular with the Austrians, Baudin made his way back to France in 1795. Here he sought the support of scientists at the Muséum d'Histoire Naturelle, Antoine-Laurent Jussieu in particular, to retrieve the abandoned collections in Trinidad for France. The scientists were able to persuade the government to finance Baudin's return to the West Indies and he sailed again from France in 1796. Refused permission by the British authorities to access the collections he had left in Trinidad he spent twelve months making new collections from the Virgin Islands and Puerto Rico in the Caribbean. He returned with these to France in 1798, arriving just in time to have them precede the parade of Italian trophies acquired by Napoleon (Brown l.c., Sanderson 2001).

Accompanying Baudin on this voyage had been the gardener Anselme Riedlé and the zoologist (or taxidermist) René Mauge, both of whom were on the subsequent voyage to New Holland. Tensions between Baudin and the young scientist Leschenault and, before he departed at Mauritius, the experienced Michaux, may well have arisen because of differing attitudes being brought to the collection of plants.

Where did the French collect plants in South Australia?

Despite the extensive surveying of the southern coastline by the French, in South Australia at least, it is clear from Baudin's account that landfall by the *Géographe* was made at only two localities where it was known to be safe. Kangaroo Island, in the Penneshaw region for three weeks in January 1803, and St Peter Island (confused with St Francis Island in the Péron narrative and on botanical collections) during 7–11 February, 1803 (Cornell 1974) were the only landfalls where collection was possible.

This lack of landings by the French captain contributed to the frustrations of the scientists on board, but may be more understandable in view of the number of shipwrecks Baudin had already been involved with in his earlier exploits.

Where are the specimens now?

The majority of specimens collected remain in the Muséum d'Histoire Naturelle (P)⁵. It would seem that they were initially given into the care of the botanist Labillardière, presumably to continue his best-selling account of the flora of the antipodes (Labillardière 1800, 1804–6). A subsequent account was not forthcoming and it was not until the Swiss botanist, Augustin Pyramus de Candolle, then based in Paris, undertook his world flora (de Candolle 1824–73) that the collections of the Baudin voyage were used as a basis for publication by a botanist. While the major part of the original collections are still mostly to be found in the Muséum d'Histoire Naturelle in Paris, the departure for Geneva by de Candolle also means that many of the specimens are duplicated in the de Candolle herbarium now housed in the herbarium of the Conservatoire et Jardin botaniques de la Ville (G) in Geneva. There seems to have been a mass transfer of Baudin expedition collections to the de Candolle herbarium in 1821. Many collections attributed to Leschenault by de Candolle in the first two volumes of the *Prodromus* (1824, 1825) or in his *Regni vegetabilis systema naturale* of 1817 (see Fig. 1) no longer bear such information. For example the types of specimens in the de Candolle Herbarium, clearly attributed by de Candolle to Leschenault (*Pittosporum phylliraeoides* DC., *Billardiera parviflora* DC. and *B. variifolia* DC., *Comesperma flavum* DC. and *C. nudiusculum* DC.) in the protologue, bear only the annotation “Herb.

Mus.Paris 1821”, with no mention of Leschenault as collector.

There can be little doubt that many of the New Holland specimens in Geneva attributed to ‘Herb. Mus. Paris 1821’ are Baudin (or Leschenault) collections – but the history of the botanical collections of the expedition on their arrival in France still needs to be established. The disappearance of Leschenault's name from later volumes of de Candolle's *Prodromus* may have something to do with the dispersal of Paris collections, either by sale or exchange, or it may be that Augustin Pyramus de Candolle was aware of just which specimens could be allocated to Leschenault because of their friendship, but this information was subsequently lost with completion of the project by his son, Alphonse Louis Pierre Pyramus de Candolle.

Other collections from the Baudin expedition were later transferred from the Paris Herbarium to the herbarium of the Institute of Botany in Montpellier (MPU), probably through the auspices of the botanist J. Cambessèdes (Peter A. Schäfer pers. comm., Jan. 2001); the extent and identity of such collections are not known. There was also transfer of some specimens to British botanists, probably by exchange, or by the buying of specimens. A number can be found in the herbaria of the Natural History Museum (BM) and the Royal Botanic Gardens, Kew (K); some of these were acquired by the purchase of private herbaria, such as that of the Frenchman Jacques Étienne Gay whose comprehensive herbarium was purchased for Kew by J.D. Hooker (Huxley 1918). At the beginning of the 1800s specimens did not belong to institutions, but rather to individuals and there was much exchange of such specimens – only rich entrepreneurs could afford to participate and the private herbaria of such people as Joseph Banks, William Hooker and de Candolle eventually formed the basis of the herbaria we know today in the BM, K and G respectively (R.M. Barker 2005).

While the herbarium specimens collected by the Baudin expedition were not obviously studied immediately on their return to France, a decided contrast with the British herbarium specimens, we will see later that a number of the French horticultural collections were the basis for the descriptions of new species from Australia.

What did the French collect in South Australia?

An attempt has been made to document the plants collected from South Australia by the French, but this is an ongoing project. A list can be found as Appendix 1, but it is by no means complete.

The scientific complement on the *Investigator*

On board *Investigator* was the young naturalist Robert Brown, supported by the gardener Peter Good and the miner, John Allen. Also included in the men of science were the natural history artist, Ferdinand Bauer,

⁵ Herbarium acronyms or abbreviations are cited in accordance with *Index Herbariorum* (Holmgren & Holmgren 2006).

the landscape artist, William Westall and the astronomer, John Crosley, making a grand total of six scientific staff. Brown, Bauer, Westall and Crosley all had a personal servant, bringing the total complement to ten, although Crosley was to leave the ship at Cape Town since he suffered badly from sea-sickness. Having participated in the whole of the southern traverse and the subsequent circumnavigation of Australia, Peter Good died from dysentery after the arrival of the condemned *Investigator* back in Sydney in June 1803. Brown and Bauer remained in Australia, both extending their collecting and illustrating activities to other parts of the colony, until their return to Britain in 1805, as luck would have it and with some trepidation for the collections, in the patched-up *Investigator*.

On their return, grand plans for a flora incorporating the coloured plates of Bauer came to nothing when Joseph Banks declined to fund such a publication. Brown eventually published the first part of the flora of Australia (Brown 1810b) at his own expense and without illustrations. With time the significance of this work was recognised, but initial sales were so dismal that Brown withdrew his *Prodromus* from sale and the second part of this work was never published. A very full account of Robert Brown's history subsequent to his visit to Australia was published by Mabberley in 1985, under the title *Jupiter Botanicus*, a reference to the esteem with which he was regarded by the botanical and scientific community, much of it because of his work on the Australian flora. As with Brown, Bauer (see below) published, at his own expense, only a very small representative sample of the paintings he had completed (Bauer 1811–16). Disappointed with their sale, he returned to his native Vienna.

Matthew Flinders accompanied his narrative of the voyage with a botanical appendix by Brown (Brown 1814) and 10 black and white line drawings of plants by Bauer.

It is not my intention to provide backgrounds for Brown, Bauer and Good since these are more than adequately covered by several readily available publications e.g. the already mentioned Mabberley (1985) for Robert Brown's life history, Vallance *et al.* (2001) for Robert Brown's diary, Stearn (1960) for an introduction to Brown's *Prodromus*, Edwards (1981) for Peter Good's diary and a background to him and Norst (1989), Mabberley (1999, 2002), Mabberley & Moore (1999) and Lack & Ibáñez (1997) for a comprehensive background to Ferdinand Bauer and his art work.

Robert Brown's plant collections

We know much of the results of the scientific work of the *Investigator* voyage. An estimate of the number of plant collections made by Brown from each Australian state and still represented in the Natural History Museum in London is given in Table 1. From that it can be seen that some 300 collections were made in South Australia while the mapping of the coastline was carried out between 28 January and 18 April 1802.

Table 1. Estimate of Robert Brown's collections from each Australian state. Totals estimated from the Robert Brown specimen database maintained by the Western Australian Herbarium and the Natural History Museum, London.

State	No. of collections
Western Australia	729
South Australia	301
Victoria	88
Tasmania	734
New South Wales	1445
Queensland	869
Northern Territory	622
Total	4788

Where were these collections made?

At the time of collection the map of the coastline produced by Flinders in his account of the voyage (Flinders 1814) clearly did not exist and nor were there any place names, with the exception perhaps of the immediately named Memory Cove and Kangaroo Island. Instead Brown annotated his specimens with numbers relating to their collecting locality; these numbers are still to be found on his collections and it is only relatively recently that their exact locations have been established (Stearn 1960; Vallance 1990); more generalised localities were documented by Burbidge (1956). Examples of labels from Brown's British Museum collections from the South coast can be seen on his British Museum collections (e.g. Fig. 3 and 4) of *Hakea leucoptera* from Inlet XII (Mt Brown) and *Sida corrugata* from Inlet 14 (top of St Vincent's Gulf).

Each of the twelve collecting localities in South Australia with their attribution on Flinders' map is given in Table 2 and shown in Figure 2. The time spent at each locality and the number of herbarium collections, seed collections and the number of Bauer paintings that were later completed from drawings at the site, are also given. Comparison can also be made with the number of collections made from King George Sound (Albany) where the time spent was much longer, the flora much more diverse, the season more favourable and there was a known water supply.

Individual specimens collected at each site are treated in the lists given in Appendix 1, together with the list of Good's seed collections for each of the localities.

Brown's collections: where are they now?

Brown's main herbarium is in the Natural History Museum (BM) in London. His specimens are easily recognisable by the blue "R.Brown, Iter Australiense 1802–5" labels (see Fig. 3) and most were assigned numbers by J.J. Bennett, who inherited the specimens on Brown's death. Major sets can also be found in Kew, Edinburgh, Leningrad (2000 specimens), Paris (1000

Table 2. Collections from South Australia by the scientists on board the *Investigator*. The date and amount of time at each anchorage is given together with the number of extant plant collections by Brown, Bauer drawings he is known to have worked up subsequently into paintings completed in his time, and number of seed collections by Good. Collections in Western Australia and Victoria are given for comparison.

Locality	Time spent	Number of plant collections	Seed collections	Completed Bauer drawings
WESTERN AUSTRALIA				
Dec. 1801 – Jan. 1802				
• King George Sound	24 days	500	c. 175	c. 49
• Bay I, Lucky Bay, E of Esperance	4 days	100	c. 70	9
• Bay II, Middle Island, Recherche Archipelago	2 days	c. 30	none listed	4
SOUTH AUSTRALIA				
• Bay III, Fowlers Bay, 29 Jan. 1802	5 am – 1 pm	23 (9 Types),	12	2
• Bay IV, St Francis Island, 2–4 & 8–9 Feb. 1802	2 days	18 (9 Types)	9	2
• Bay V, St Peter Island, 7 Feb. 1802	6 am – 1 pm	6 (3 Types)	3	1
• Anchorage VI, Waldegrave Island, 11 Feb. 1802	9 am – 1 pm	21 observed, 1 known collection, but 10–12 algae noted	none	-
• Anchorage VII, Flinders Island, 13 Feb. 1802	8 am – ?	4	2	-
• Anchorage VIII, Thistle Island, 21 Feb. 1802	6 am – 12.30 pm	15	4	-
• Bay IX, Memory Cove, 22–24 Feb. 1802	3 days	35 (13 Types)	29	1
• Bay X, Port Lincoln, 25 Feb. – 5 Mar. 1802	8 days	88	37	1
• Anchorage XI, Kirkby Island, 7 Mar. 1802	8 am – 12 noon	2 (1 Type)	2	-
• Inlet XII, Mt Brown, 10–11 Mar. 1802	2 days	60	33	3
• Anchorage XIII, Kangaroo Island, 21–23 Mar. & 1–7 Apr.	4–5 days	35 (9 Types)	14	-
• Inlet XIV, Top of St Vincent's Gulf, 30 Mar. 1802	1 day	10	none	-
VICTORIA				
• King Island, 23–24 Apr. 1802	1 day	c. 30	14	-
• Port Phillip, 27 April–2 May 1802	c. 3 days	c. 88	40	1

specimens), Dublin (1000 specimens) and Canberra (1000 specimens). Herbaria in Melbourne and Sydney hold some numbers of Brown duplicates and there are also some in Brisbane and Hobart. Adelaide, Darwin and Perth herbaria are all poorly endowed with Brown material.

There are only about a dozen Brown duplicates mounted on normal herbarium sheets in the State Herbarium of South Australia, all of these acquired relatively recently by donation from the Natural History Museum (BM) in London. However there is also an interesting small book containing a collection of 19 Brown orchid duplicates which were given to the South Australian orchid specialist R.S. Rogers in 1915 by the British botanist, A.B. Rendle. Accompanying these

specimens are tracings, with added colour, of three of Bauer's original paintings of orchids.

Ferdinand Bauer's herbarium specimens

Ferdinand Bauer also collected herbarium specimens. Whether he collected specimens only of those plants which he had drawn is not known since there has been no analysis of those which survive and even if there was, there is presently no listing of the Bauer field drawings for South Australia as there is for Western Australia (Pignatti-Wikus et al. 2000a, b). Some of his collections are included in the Brown herbarium (see Moore in Vallance et al. 2001, p. 19). However, many⁶ are also

⁶ In an early register of the contents of Bauer's herbarium in W the number of plant specimens was given as 3339 and

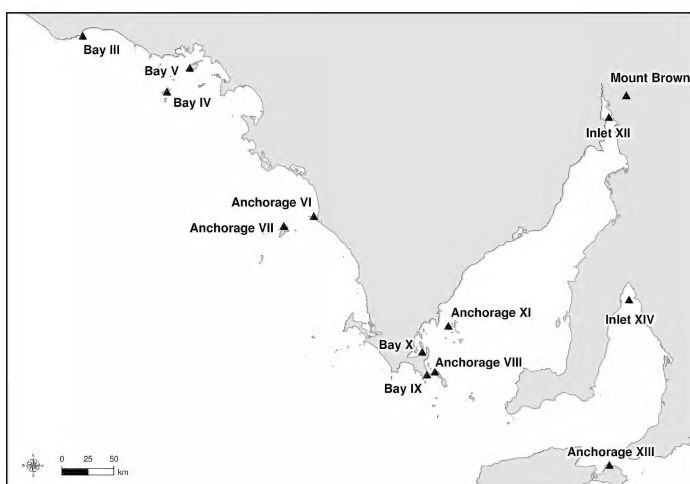


Fig. 2. Plant collecting localities of Robert Brown and Peter Good along the South Australian coast-line; names are given as they appear on the labels of the plant specimens. Modern day equivalents are Bay III, Fowlers Bay; Bay IV, St Francis Island; Bay V, St Peters Island; Anchorage VI, Waldegrave Island; Anchorage VII, Thistle Island; Bay IX, Memory Cove; Bay X, Port Lincoln; Anchorage XI, Kirkby Island; Inlet XII, head of Spencer Gulf and Mt Brown; Anchorage XIII, Kangaroo Island; Inlet XIV, head of St Vincents Gulf. Lists of plants and seeds collected at each of the localities are given in Appendix 2.

to be found in the Naturhistorisches Museum in Vienna (W).

With his failure to sell his illustrations of Australian plants, Bauer left England in 1814 to return to his native Vienna, taking with him his field drawings and botanical collections. As part of the revision of *Hakea* for *Flora of Australia* specimens were borrowed from the Naturhistorisches Museum in Vienna and amongst these specimens were Bauer herbarium collections of *Hakea prostrata* R.Br. (Fig. 5) and *H. linearis* R.Br from Western Australia. Whether there are also field drawings of these species in Vienna has yet to be established, but it seems unlikely. Brown makes no mention in his manuscript of Bauer having illustrated these particular species, whereas he does indicate Bauer illustrations for a number of other species; Proteaceae was one of the families in which specimens were largely destroyed by fire in 1945.

The gardeners and the living plant collections

Probably one of the most immediate and visible impacts in Europe of the Flinders and Baudin voyages

would have been as a result of the efforts of their ships' gardeners: their booty was dispersed to gardens in Britain and France, and from there to other colonies and European countries. Many of the plants they collected were botanical curiosities and as well as being displayed in gardens in Kew and Paris were illustrated in the fashionable botanical periodicals of the day. But the gardeners who made these collections mostly did not fare well and certainly carried out their work under trying conditions and without those few comforts that the scientific gentlemen on board were allowed.

The French gardeners

There were five gardeners attached to the French ships when they departed France. Two of these, Cagnet and Merlot, went no further than Île de France (Mauritius). As we have already seen, Anselme Riedlé of the Jardin des Plantes in Paris had accompanied Baudin on his earlier plant collecting expedition. He was involved in significant plant collecting along the Western Australian coast line in the early parts of the voyage but succumbed to dysentery in Koepang, Timor, on 21st October 1801. Baudin, himself sick with malaria, ensured that his friend was buried alongside Bligh's gardener on the *Bounty*, David Nelson (Brown 2000). The genus *Riedlea* (= *Melochia*) and *Macrozamia riedlei* from south-west WA are named after him. His manuscript diary is listed as being in the library of the Muséum d'Histoire Naturelle (Riedlé unpubl.).

The assistant gardener, Antoine Sautier, about whom little is known, also succumbed to dysentery some days after Riedlé, and was buried at sea. *Sautiera* (Acanthaceae) was named after him (van Steenis-Kruseman 1950).

Only one of the assistant gardeners, Antoine Guichenot, survived the journey to return to Paris in March 1804, with seed collections and a great number of tubs of living plants. Guichenot apparently (van Steenis-Kruseman 1950) revisited Australia and the Pacific on Freycinet's voyage in the *L'Uranie* from 1817–1820⁷, but little else is known about him. The genus *Guichenotia* of south-west Western Australia, was named in his honour by the French botanist Jacques Étienne Gay (Gay 1821).

the number of illustrations as 1876 (Pignatti-Wikus et al. 2000). A significant portion of the herbarium (gymnosperms, monocotyledons (except for orchids, grasses and Juncaceae partly) and families of dicotyledons (Proteaceae, Amaranthaceae, Chenopodiaceae) up to Ranunculaceae in the Engler system) and associated illustrations, were destroyed by fire in 1945.

⁷ There are no gardeners listed at all amongst the participants of this voyage in Brosse (1983), but the six-volume account of the voyage by the leader Freycinet has not been checked. Freycinet, who had been on the *Géographe* with Baudin, decided that civilians would not be involved in the voyage; naval surgeons, who were also competent naturalists, dealt with the natural history collecting.

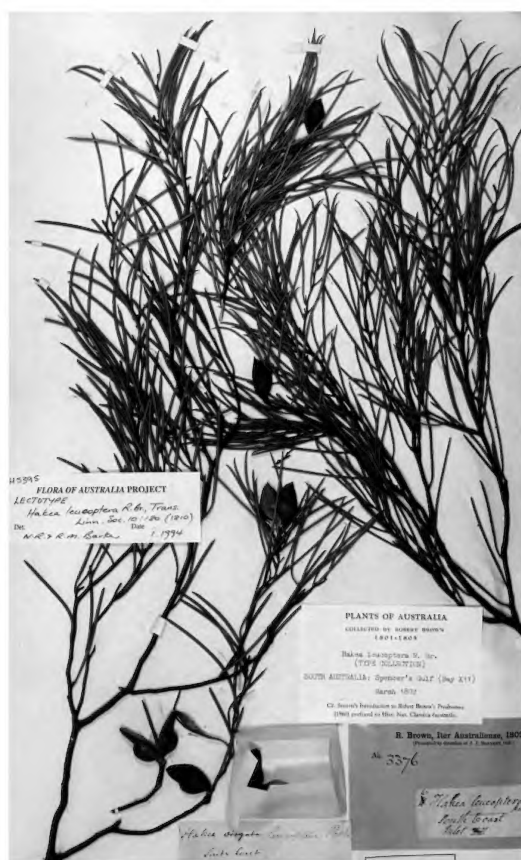


Fig. 3. Specimen of *Hakea leucoptera* R.Br. collected by Robert Brown from Inlet XII (Mt Brown). The specimen is housed in the Natural History Museum, London. These are the specimens that should be consulted for specific information about the collecting locality. The printed label with "R. Brown, Iter Australiense, 1802-5" on the top is blue, making the Brown collections easily identifiable. The number 3376 was assigned to the specimen by J.J. Bennett and the handwritten label fixed to this one was written by Robert Brown. This is the label indicating where the specimen was collected as it is annotated as Inlet XII. The typed label headed "Plants of Australia" was produced at the time of Stearn's introduction to the facsimile edition of Brown's *Prodrum* (1960). Duplicates of Brown's collections distributed to other herbaria usually have only the information shown on the other handwritten label to the left of the Bennett label. In this case it is merely labelled as *Hakea virgata* from the South Coast.

The British gardener

There was only a single gardener on board the British ship. Peter Good had trained at Kew Gardens and before his time in *Investigator* had been employed to bring plants back from India for Kew Gardens. As much as is known about him is recounted in the introduction to his diary (Edwards 1981). Good died on the return to Port Jackson and some of his collections were undoubtedly absorbed into the collections of Brown, since he is



Fig. 4. Natural History Museum (BM) specimen of *Sida corrugata* Lindl. collected by Robert Brown from Inlet XIV (top of St Vincent's Gulf). The specimen has been annotated by Brown as '*Sida prostrata*'.

attributed with little in the way of collections from the northern traverse of Australia.

Instructions to gardeners – a contrast

Gardeners were answerable to the botanist or naturalist on board and they were not treated as gentlemen, but rather were expected to mess with the warrant officers (gunners, carpenters, boatswains) and be accommodated similarly.

French instructions

French Instructions to the gardeners were similar to those given to the British gardeners. Reproduced below are the instructions given to Bruny d'Entrecasteaux on his 1791–93 expedition in search of La Pérouse, for the gardener Félix Delahaye; Delahaye later became gardener at Malmaison, the residence of Napoleon and Josephine. The same person was responsible for the instructions to Baudin and so it is unlikely that his instructions would have varied from those given below. One notable difference between the French and British instructions is the French vision that the plants were to be spread around the world, unlike the usual instructions from Joseph Banks where the plants were always to be destined for Kew and on no account were to be given to anyone else.

The gardener is not to be included among the naturalists. His duties will be to sow European seeds that offer a chance to prosper in the lands that you will land, and to indicate as best he can to the natives of the country, the way to cultivate and reproduce them. He must pay particular attention to those products that can contribute to the subsistence of man. The culture of useful plants or shrubs which will be deemed to transport easily to our climate, must be entrusted to his care;

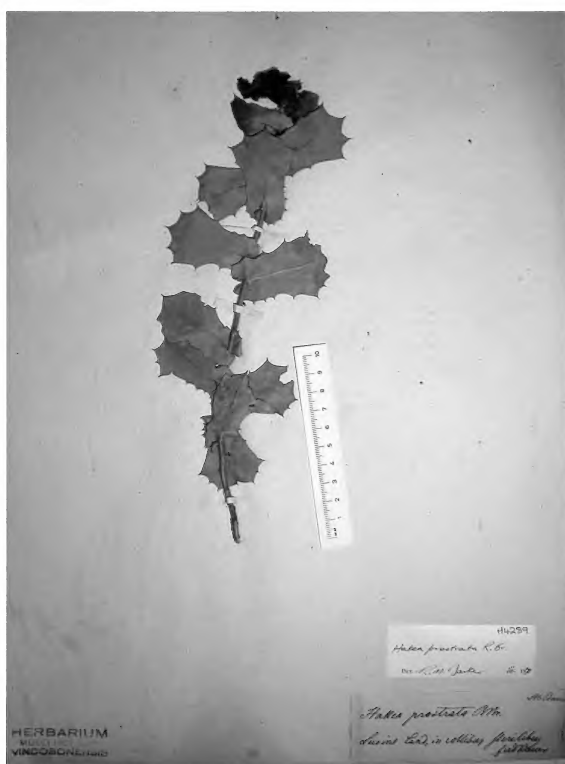


Fig. 5. *Hakea prostrata* R.Br. Collection in Naturhistorisches Museum of Vienna by Ferdinand Bauer from Lewin's Land, Western Australia. Lewin's Land is an early Dutch name for the south-western corner of Western Australia, first discovered in 1622.

and our colonies would be rendered an important service, if the breadfruit tree could be procured for them, as well as other nutritious products which are specific to the Great Ocean. You would leave them at Île-de-France [Mauritius], where they could be cultivated and reproduced, so as to be later transported to our islands in America.

The gardener must as well assist with all his zeal the efforts of the naturalists; although his functions will necessarily be subordinate to them, whose considerable learning has trained them to appreciate the utility of each and every product.

Letter from M. de Fleurieu, Minister of Marine, to Bruny D'Entrecasteaux for his 1791–3 expedition (Duyker & Duyker 2001, p. 296)

British instructions

Joseph Banks' standard instructions to gardeners accompanying expeditions included the following:

... as it is deemed Proper that the new Plants discovered in your voyage Should first appear in the Royal Botanic Gardens at Kew you are not on any Pretence to Furnish any Person with any Part of your Collections of Seeds Bulbs or Succulent Plants

Joseph Banks' instructions to assistant Gardener Lockhart prior to his departure on the ill-fated 1816 Tuckey expedition of discovery of the Congo (Carter 1988, p. 502)

You are not ... to allow any Person whatever to Receive or under any Pretence to Obtain from you any part of the seeds or any of the Plants or bulbs Collected by you while you continue in your Present Employ Should any new Plant sent...by you to Kew appear in any other Garden, an Enquiry will be immediately set on Foot to Find out in what way...it was procured & if it Proves to have been obtained from you in any Circuitous manner whatever your having Parted with... it will be deemed a breach of the Fidelity you owe to your Employers

Joseph Banks to Allan Cunningham (Gilbert 1986, p. 28)

That these kind of instructions were universal is shown by Peter Good's objection to Banks before setting sail:

So that it appears to me that every article of our industry and collections shall become the immediate property of Mr Brown except only so much as may be selected by the Lords of the Admiralty and also the Seeds and living plants which I understand to be wholly intended for His Majestys collections, and will entirely deprive the Miner and me from being able to present the Lords of the Admiralty with the most trifling Article or deriving any benefit from that article of indulgence. I earnestly wish an explanation of the subject, as also to know whether I will be permitted the honor of being recorded as the introducer of such plants and seeds as I shall be able to collect to introduce.

Letter from Peter Good to Joseph Banks, 6 May 1801 (reproduced in Edwards 1981).

French horticultural collections

Where did the living specimens and the seeds end up? Because of the great interest shown by the Empress Josephine in the collections of Australian plants and animals, many of them ended up at Malmaison, then just outside of Paris, as well as the Jardin des Plantes. Indeed there was some rivalry between the two gardens with the Minister of the Interior ordering that plants be made available to Empress Josephine for Malmaison (see Jill, Duchess of Hamilton 1999 for some of the correspondence concerning the allocation of the collections). A botanist, Étienne Pierre Ventenat, and an "official painter", Pierre-Joseph Redouté (see below), had been appointed to the staff of the Empress. Between 1803 and 1805 Ventenat published an account of forty-six Australian plants growing at Malmaison: amongst these were *Josephinia imperatricis* Vent., *Apium prostratum* Labill. ex Vent. and *Hibiscus heterophyllus* Vent., all described from plants grown from seed attributed to Captain Hamelin of the *Naturaliste*. Hamelin had returned to France in July 1803, some eight months before the *Géographe* returned. The descriptions of these plants were accompanied by Redouté's illustrations. Redouté's monograph of the Liliaceae

(Redouté 1802–16) also included four collections made by Baudin's party, amongst them *Anigozanthos flavidus* DC. collected by Baudin, Guichenot and Riedlé from Albany in 1801. There is no obvious connection with any South Australian plant collections in either of these publications.

After Ventenat's death in 1808, Aimé Bonpland was appointed in his place and he too was responsible for the publication of the names of some of the Australian plants by then growing in the grounds of Malmaison. Two of these, of particular interest to us because they almost certainly came from seed from Kangaroo Island, were *Eucalyptus diversifolia* Bonpl. and *Acacia paradoxa* DC., collected by the French during their visit to the island in January 1803 (see Appendix 1). Other plants resulting from South Australian collections by Baudin's party may well have become established in Malmaison or the Jardin des Plantes but they were either not documented or have yet to be revealed. *Acacia dodonaeifolia* (Pers.) Balb., first described by Persoon in 1806 as *Mimosa dodonaeifolia* from material cultivated in the Paris Botanic Gardens, *Acacia anceps* DC., collected from St Peter Island, and *Acacia leiophylla* Benth., described from a collection by William Baxter from Kangaroo Island, are all possibilities as introductions by the French from South Australia.

In describing *Eucalyptus diversifolia* for the first time, Bonpland (1814) further noted that seed of Australian species in Malmaison had been sent to Toulon Botanic Garden on the Côte d'Azur, where they were thriving. In a similar fashion, de Candolle described *Acacia paradoxa* in 1813 from cultivated material from the Montpellier Gardens (presumably Le Jardin des Plantes, one of the first Botanic Gardens established in Europe). Some years later a number of Australian species of eucalypts and acacias were to invade this area, as well as Corsica and Algeria, South Africa and St Helena, a problem that continues to this day in some of these places. *Flora Europaea* (Flora Europaea undated) presently lists 14 species of *Eucalyptus* and 10 species of Australian *Acacia* as naturalised in Europe; whether any of these were initially introduced as a result of the Baudin voyages has not been ascertained but a number of *Acacia* species had already been established on St Helena by 1805 (Anon. 1805). In contrast to their invasiveness in other parts of the world, there is apparently now not a single eucalypt to be seen in the grounds of Malmaison (Zacharin 1978).

British horticultural collections

Peter Good's seed lists

Peter Good made a list of seed gathered (Fig. 6) for each of the collecting localities in South Australia from Fowlers Bay to Kangaroo Island. These lists can often be matched with Brown's specimens to determine the identity of a particular collection. They are reproduced

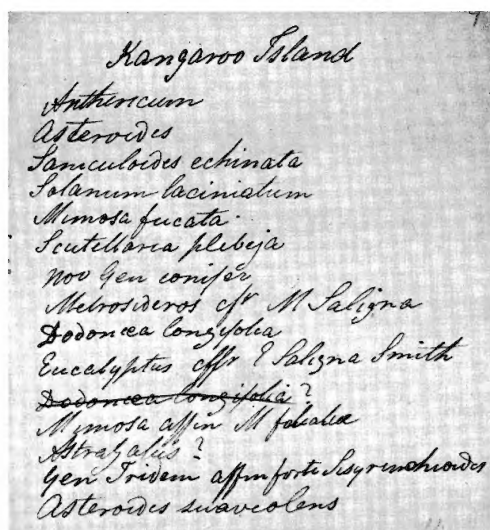


Fig. 6. Peter Good's list of seeds collected from Kangaroo Island. Reproduced from the Journal of Peter Good (Edwards 1981).

below, with comments as to the possible identities of the plants mentioned, where this was possible. Good would presumably have consulted with Robert Brown when giving a name to his seed collection and, by matching Brown's manuscript name for a species with those written by Good for the seeds, most of the seed collections can now be identified or at least narrowed as to their identity.

Collections of seed did not necessarily relate to the plants collected by Brown at any one site. Good collected *Apium prostratum* on St Francis Island, but there is no corresponding herbarium collection by Brown from there. He collected "Mimosa spinosissima" (*Acacia paradoxa*) from Flinders Island and Memory Cove but the only extant Brown collection is from Memory Cove. Good's seed list for Anchorage V (St Peter Island) includes *Alyxia buxifolia* R.Br., for which there are no extant Brown collections; all existing Brown collections of this species (Bennett 2854) are from Western Australia or Victoria.

Peter Good's living collections and seed collections – what happened to them?

By the time they finished their traverse along the South Australian coast line, Peter Good had collected 145 different seed collections from South Australian shores. He had already gathered nearly 250 seed collections from Western Australia (c. 175 from King George Sound and c. 70 from Lucky Bay). Thus he had a total of nearly four hundred and fifty seeds from the South Coast traverse when he reached Port Jackson.

While in Port Jackson, Good recorded in his diary on the 21 May 1802 (Edwards 1981), that he had gone on board the *Investigator* and brought ashore the seeds

“to separate and send a part by the *Speedy* whaler for England”. The *Speedy* left Sydney on 6 June 1802. Brown described it to Banks as a “very small box of seeds” (Brown to Banks, 30 May 1802: Vallance et al. 2001, p. 204), a larger box not being able to be procured in time for the departure of the boat. Mabblerley (1985, p. 94) records that it consisted of two hundred and fifty three seed packets, a figure which represents a larger percentage of the four hundred and fifty collections made to that time, than would be expected by Brown’s comment. There is no record of the size of the collection in Good’s diary (Edwards 1981), but again, according to Edwards (1981), Banks wrote on the 24 April 1803 to inform Brown that the first collection of seed, sent in June 1802, had arrived and been planted at Kew.

Aiton’s *Hortus Kewensis*

Within the five volumes of the second edition of Aiton’s *Hortus Kewensis* (1810–13), a list of the plants then growing in Kew Gardens, Peter Good is credited (Fig. 7) with a hundred and three introductions of Australian plants in 1803. Those plants likely to have originated from Good’s South Australia collections are listed in Table 3. Of the 145 seed collections estimated to have been made in South Australia (see Table 2), only about 12 species seem to have been successfully grown at Kew.

Other plants grown successfully at Kew

Aiton’s list is clearly not a complete listing of plants introduced by Good. It is meant to be a listing of the person responsible for introducing a plant to Kew for the first time, and there were of course a number of plants, particularly those from the east coast and King George Sound, which would already have been known from other collectors.

However there are some species known to have been grown at Kew that do not appear in Aiton’s list. For example, seed of the endemic *Hakea vittata* was collected from Port Lincoln (see Peter Good’s listing for Bay X below). That it was subsequently grown at Kew can be seen from Robert Brown’s manuscript concerning this species (R. Brown, unpublished, see Fig. 8). Brown’s original description of *H. vittata*, made while on board the *Investigator*, indicates that flowers were not seen. The description is only of the leaves, fruits and seeds. In his manuscripts (Fig. 9) there is a subsequent description

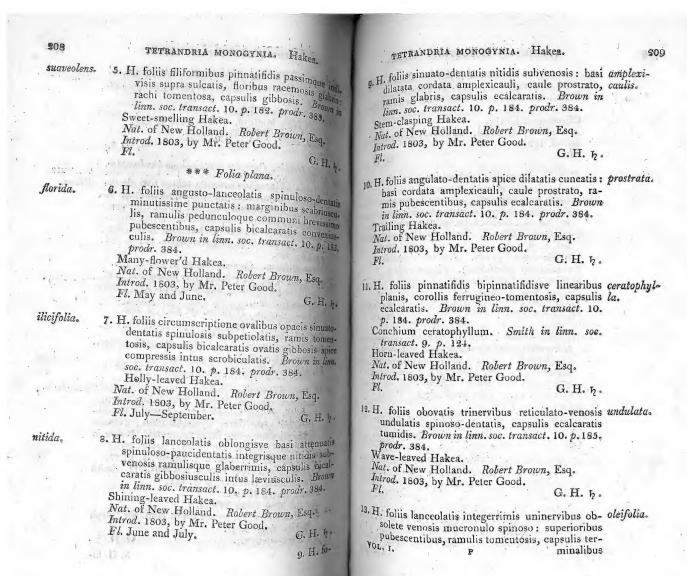


Fig. 7. Pages reproduced from Aiton’s *Hortus Kewensis* (1810) indicating *Hakea* species introduced to Kew by Peter Good. *Hakea* species are particularly well represented because of the protection afforded the seed by the fruit.

of the flowers, including the pollen, from material grown at Kew Gardens⁸.

In the case of the Proteaceae and Myrtaceae in particular it is quite possible that fruits collected for the herbarium were later used as a source of seed for the gardens. Many of them would not have been open at the time of collection, but would have released their seed during the storage and travel time. These attributes of the fruits would account for the number of *Banksia* and *Hakea* (Fig. 7) species collected by Good, which were to be successfully raised at Kew, whereas the numerous *Grevillea* species with their more fragile fruits were rarely mentioned in Good’s lists.

A subsequent collection of seeds from Kangaroo Island

In the protologue of *Sisyrinchium cyaneum* Lindl. (now *Orthrosanthus multiflorus* Sweet) Lindley (1827; see Fig. 10) noted that Brown saw the plant on Kangaroo Island “with no perfect fructification”, and that Leschenault subsequently observed it in the same place, but seed material had finally been collected from the island by William Baxter.

⁸ This description of the flowers of *H. vittata* was never published since Brown’s accounts in the *Transactions of the Linnean Society* (Brown 1810a) and in the *Prodrum* (Brown 1810b) are identical; both state that flowers were not seen. As Brown provided no specific epithet, he may not have known to which species the flowering material belonged.

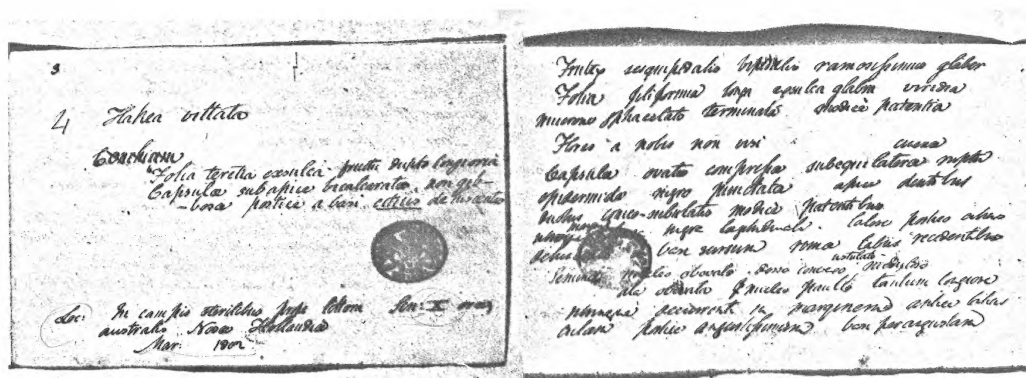
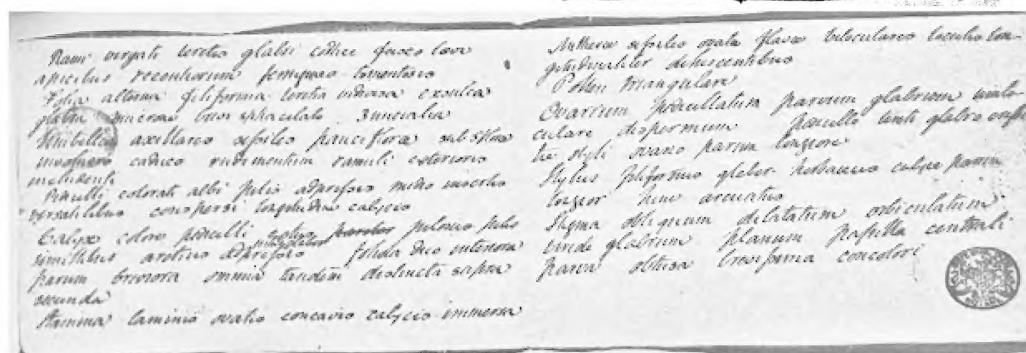
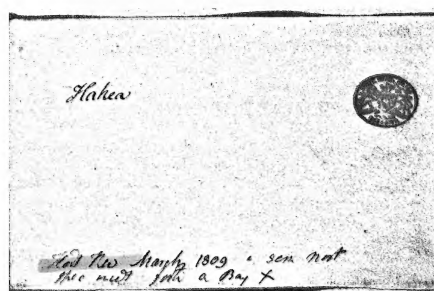


Fig. 8 (top left and right). Robert Brown's manuscript account in Latin (Brown unpubl.) of *Hakea vittata* based on the specimens collected by him from Bay X (Port Lincoln) in March 1802. Flowers were absent (see "Flores non visi" in the manuscript); only fruits were present.

Fig. 9 (right and below). Robert Brown's manuscript account in Latin (Brown unpubl.) of *Hakea vittata* based on a plant grown at Kew ("Hort. Kew March 1809") from the seed collected at Bay X (Port Lincoln). The description contains information about flowers and a description of the pollen.



Baxter was a British seed collector sent out to the colonies by Francis Henchman, a British nurseryman (Miller 1970). Baxter collected on Kangaroo Island, probably in 1822 or 1823, and at this time also presumably collected seeds of *Correa pulchella*, *Eucalyptus baxteri*, *Acacia triquetra*, *Acacia leiophylla* and *Grevillea dilatata* since all of these names are based on Baxter collections reputedly from Kangaroo Island (APNI 2006: search in September 2005). *Correa pulchella* was in flower in England by 1824 (Sweet 1827). Baxter later collected copiously in the Albany region and many of Robert Brown's new Proteaceae (Brown 1830) were based on his collections.

To be of use to future navigators in these regions – sowing seeds

Both the British and the French made a practice of planting seeds of food plants at landfalls on these voyages. Peter Good's list of seeds for Kangaroo Island, planted near the "spring and various other situation of the island" in April 1802 is reproduced in his diary (Edwards 1981; Fig. 11). There is no apparent connection to any plants that have subsequently become weedy on the island. Indeed there was no mention in the Baudin account (Cornell 1974) of any evidence of Good's industry when the French visited the same part

Table 3: South Australian species introduced to Kew Gardens as a result of the *Investigator* voyage. These introductions were recorded in Aiton's *Hortus Kewensis* (1810-1813).

Plant introductions credited to Peter Good in 1803	Collection locality
<i>Ixodia achilleoides</i> R.Br.	Anchorage VIII (Thistle Island), IX (Memory Cove) and X (Port Lincoln)
<i>Cassinia aurea</i> R.Br. = <i>Angianthus tomentosa</i> Wendl.	Bay IV (St Francis Island)
<i>Westringia dampierii</i> R.Br.	Anchorage III (Fowlers Bay), IV (St Francis Island), VI (Waldegrave Islands) and VII (Flinders Island)
<i>Acacia armata</i> R.Br. = <i>A. paradoxa</i> DC.	Kangaroo Island & Bay IX (Memory Cove)
<i>Lotus australis</i> Andrews	Inlet XIV (top of St Vincent Gulf)
<i>Pultenaea vestita</i> R.Br.	Bay X (Port Lincoln)
<i>Sclerothamnus microphyllus</i> R.Br. = <i>Eutaxia microphylla</i> (R.Br.)J.Black	Anchorage VIII (Thistle Island)
<i>Templetonia retusa</i> (Vent.)R.Br.	King George Sound (Albany) and Bay IX (Memory Cove)
<i>Myoporum viscosum</i> R.Br.	Bay IX (Memory Cove)
<i>Myoporum parvifolium</i> R.Br.	Bay X (Port Lincoln)
<i>Stenochilus glaber</i> R.Br. = <i>Eremophila glabra</i> (R.Br.)Ostenf.	Bay III (Fowlers Bay) & Inlet XII (Mt Brown)
<i>Melaleuca decussata</i> R.Br.	Bay X (Port Lincoln)

of the island for three weeks in January 1803, some nine months after Good planted these seeds.

As well as planting seeds, animals were also left behind. Baudin left a rooster and two hens and a boar and sow at the spring on Kangaroo Island in the hope that they would multiply. He was careful to request that the American sealer, Pendleton, whom he later met in King Georges Sound and pointed in the direction of Kangaroo Island, "prevent his men from killing the pigs and poultry [that he had] left there for the use of future navigators" (Brown 2000, p. 345). Hog Bay was probably named in recognition of the success of this request.

Botanical illustrations from the voyages

Both the British and the French carried artists on board their ships, but only Ferdinand Bauer on board the *Investigator* was specifically illustrating botanical subjects in the field. Despite his prolific output only a very small percentage of Bauer's work was published at the time. The artists on board the French ships concentrated predominantly on animals and marine organisms. It was artists in Paris, working with botanists, who illustrated Australian plants grown in French gardens from the collections of the French voyage.

French illustrations of Australian plants

When the French left Le Havre in 1800, they had on board three official artists. They also had on board two other artists who had been signed on as assistant gunners but in reality for their abilities as artists. Baudin employed Lesueur and Petit to illustrate the Captain's

log with drawings of all of the marine creatures encountered (Bonnemains 2002)

The three official artists left the ships at Île de France, almost certainly having been offered a more comfortable and more lucrative life style on the island, particularly when compared with conditions on board the ships.

The unofficial artists, Lesueur and Petit, subsequently became fully occupied by the zoologist Péron; Petit specialised in portraying the people and coastal studies and Lesueur in painting the animals. There appear to be no paintings by Lesueur, in particular, that are wholly devoted to plants. Instead they appear only incidentally in his depictions of the animals of Australia. Apart from the illustrations of Piron, who accompanied Labillardière on the d'Entrecasteaux Voyage (Duyker & Duyker 2001) French drawings of Australian plants were mostly done

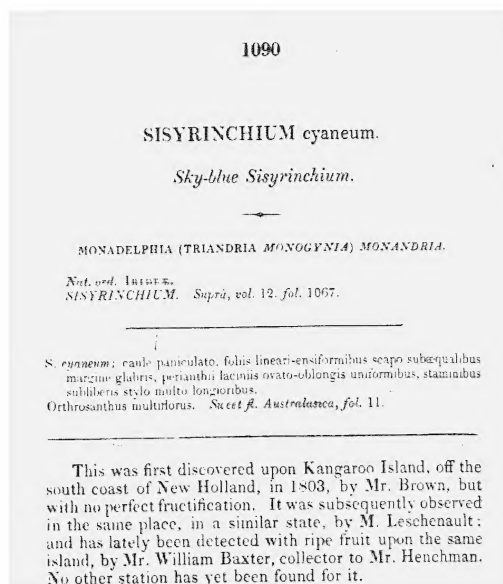


Fig. 10. Lindley's 1827 account of the collection of *Sisyrrinchium cyaneum* (now *Orthrosanthus multiflorus* Sweet) from Kangaroo Island in *Botanical Register*. Note that both the British and the French made collections of this species, neither of them with seeds present. The 1803 date presumably relates to when seed collections were received at the Royal Botanic Gardens, Kew; almost all of Peter Good's seed introductions to Kew are attributed to Aiton (1810-13) as 1803.

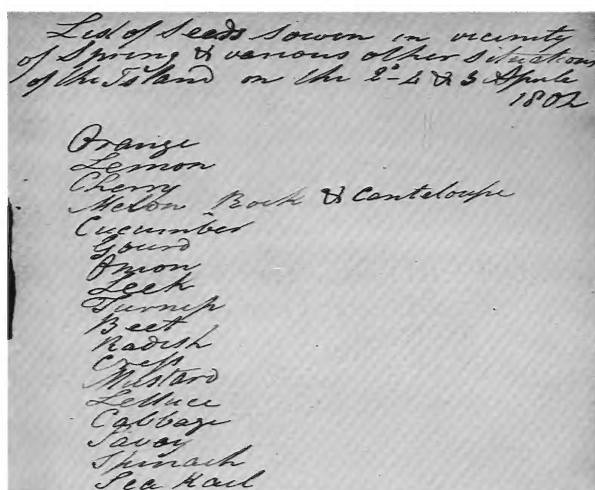


Fig. 11. Peter Good's list of seeds planted at the spring on Kangaroo Island. Reproduced from the Journal of Peter Good (Edwards 1981).

in Europe for French botanists describing these plants, often from garden collections. And in stark contrast to the work of Ferdinand Bauer, the French illustrations were published at the time of their painting, accompanying a formal botanical description of the plant.

One of the artists most closely associated with such illustrations was Pierre-Joseph Redouté (1759–1840). Redouté, Belgian by birth, and from a long line of painters, first came to Paris in 1782 to join his brother. His interest in painting flowers took him to the Jardin du Roi, and it was here that he is assumed (Blunt 1963) to have met the French magistrate and amateur botanist, L'Héritier de Brutelle. Redouté's first Australian plant illustration was probably that of the type species of *Eucalyptus*, *E. obliqua*, which was published in 1789 in L'Héritier's *Sertum Anglicum*, based on rare plants "cultivated in the gardens around London, especially in the Royal Gardens at Kew" and "observed from the year 1786 to the year 1787". Redouté had joined L'Héritier in London at this time. The specimens of *E. obliqua* had been collected on Cook's third voyage by David Nelson and William Anderson (L'Héritier de Brutelle 1789).

Redouté next illustrated Australian plants for Jacques-Julien Houtou de Labillardière, botanist of the 1791–93 d'Entrecasteaux voyage in search of La Pérouse. In his first account of the botany associated with the voyage in the 2 volume *Relation du voyage a la recherche La Pérouse* (Labillardière 1800), the accompanying Atlas contained depictions of the people, birds and plants as well as maps. There were 12 plates of Australian plants, some of them by the artist of the voyage, Piron, improved by Redouté, others by Redouté alone. Editions of this work were so popular that that it was reprinted twice in France before the end of the year, three times in England, between 1800 and 1802, twice

in Germany (1801 and 1804) and a Russian edition was also produced (Duyker 2003).

Later, between 1804 and 1807 Labillardière published *Novae Hollandiae Plantarum Specimen*, the first comprehensive account of the Australian flora to that time. Included in this work were a few of the specimens collected by Baudin's expedition (discussed by Carr & Carr 1976; Nelson 1974, 1975). Each plant was comprehensively described and was accompanied by a line drawing, the majority of these by Pierre Antoine Poiteau. Redouté's contribution was four *Eucalyptus* plates (Labillardière 1804–06).

Redouté's depictions of Australian plants continued with the publication of plates to accompany Ventenat's descriptions of cultivated plants growing in the garden of the horticulturist Jacques Martin Cels in Paris (Ventenat 1800–03). Twenty-three Australian plants were depicted in this publication, none of them emanating from collections made in South Australia.

Redouté and Ventenat were subsequently employed by Empress Josephine to paint and describe plants growing in the garden at Malmaison, the home of Napoleon and Josephine. Many of these plants were Australian, some of them originating from collections made by the Baudin expedition. On the death of Ventenat, the botanical role was taken over by Bonpland. *Eucalyptus diversifolia* Bonpl. and *Acacia paradoxa* DC. from Kangaroo Island (see above) were described by Bonpland (1812–17) and painted by Redouté⁹ in an account of plants growing in the gardens of Josephine at Malmaison and Navarre¹⁰. It is noticeable that the cultivated plant of *Acacia paradoxa* appears to be less spiny than in its native habitat.

Whether there are other unpublished botanical illustrations resulting from the Australian collections gathered together in France at this time has never really been investigated. The philosophy of dispersal of garden material within France and adjoining countries as well as within French colonies makes it possible that there are more illustrations of Australian plants (and perhaps South Australian plants) from this time still to be found.

⁹ Or possibly Pancrace Bessa (1772–1835). Redouté signed the original watercolour of *Eucalyptus diversifolia* but the mirror-image painting in Bonpland is attributed to Bessa, who also produced illustrations for this work. They are reproduced side by side in Hewson (1999).

¹⁰ Colour plates associated with *Eucalyptus diversifolia* are reproduced in Hewson (1999, p. 68) and also in Jill, Duchess of Hamilton (1999, p. vi). A colour plate of *Acacia paradoxa* (as *A. armata*) is reproduced in the latter publication (Jill, Duchess of Hamilton 1999, p. 159). Both plates can also be seen in black and white on microfiche in the Botanic Gardens and State Herbarium of South Australia library or in colour on the Rare Book website (Missouri Botanic Gardens 1995–2006) where the Bonpland book is reproduced.

British illustrations of Australian plants

Ferdinand Bauer illustrations based on South Australian material.

On his return to London in 1805, Ferdinand Bauer was employed for some years to produce paintings of those plants he had drawn and colour coded in Australia. Of the c. 2000 drawings done by him while in Australia, only a relatively low percentage became fully coloured paintings. Most of these (c. 200) were presented to the Admiralty, where they languished for many years, until eventually being presented to the British Museum (Natural History)¹¹ in 1843 (Mabberley & Moore 1999). Ten of the finished plates were based on plants drawn and collected in South Australia¹²; these were:

- **Eremophila glabra* (R.Br.)Ostenf. (from Fowlers Bay and/or Mt Brown)
- Scaevola spinescens* R.Br. (Fowlers Bay)
- Enchylaena tomentosa* R.Br. (St Francis Island)
- Sarcostemma viminalis* (L.)R.Br. ssp. *australe* (R.Br.) P.I.Forst. (St Francis Island)
- **Solanum hystrix* R.Br. (St Peter Island)
- **Dodonaea humilis* Endl. (from Memory Cove)
- Grevillea pauciflora* R.Br. (Port Lincoln)
- **Eremophila scoparia* (R.Br.)F.Muell. (Mt Brown)
- **Cynanchum floribundum* R.Br. (Mt Brown)
- Senna artemisioides* (Gaudich. ex DC.)Randell (Mt Brown)

A small number of Bauer's drawings were reproduced as line drawings in Flinders (1814) account of the voyage, and Bauer attempted to publish some himself in his *Illustrationes* sets (Bauer 1813–16) when it became clear that Joseph Banks was not going to assist either Brown or himself to publish their results. The latter were available either in colour or as black and white line drawings.

None of the plants depicted in these two publications were based on South Australian collections, although some of the species do occur in the state, e.g. *Brunonia australis* Sm. ex R.Br., *Azolla pinnata* R.Br. from Flinders (1814) and *Levenhookia pusilla* R.Br., *Tricoryne elatior* R.Br. (Fig. 12), and *Stylidium calcaratum* R.Br. of the *Illustrationes*.

Those illustrations produced for sale within *Illustrationes* were often different from the finished drawings of the same species presented to the British



Fig. 12. *Tricoryne elatior* R.Br. Plate 11 of the *Illustrationes* (Bauer 1813–16) produced by Ferdinand Bauer at his own expense for sale to the public. This illustration differs considerably from his illustration of the same species for presentation to the Admiralty. (Reproduced from microfiche in Botanic Gardens & State Herbarium, Adelaide).

Admiralty. Thus the image of *Tricoryne elatior* R.Br. in the *Illustrationes* (Fig. 12) has fewer branches, has had roots added to the plant and also has a depiction of fruits; the fruits are absent from the Admiralty painting and the flower and umbel with spent flower are quite separate, whereas they overlap in the published illustration.

Bauer's field drawings

Bauer returned to Vienna in 1813, taking his original drawings with him. On his death in 1826, these were purchased by Emperor Franz I and donated to the Naturhistorisches Museum of Vienna where they are still to be found (Riedl-Dorn in Pignatti-Wikus et al. 2000b). A copy of one example of a field drawing, *Zygophyllum billardiarei* DC., found in the collection of Zygophyllaceae papers of the late HJ. Eichler is reproduced here (Fig. 13); the rearranged and "finished" drawing which would have been done on the return to Europe was also within the papers. On the field drawing

¹¹ The institution still houses them today. It has been recently renamed the Natural History Museum, London.

¹² The original Bauer paintings of the asterisked species were displayed at the Art Gallery of South Australia in their *The Encounter 1802* exhibition in 2002. The plates were reproduced in the catalogue of the exhibition with a botanical commentary for each of them by the author (R.M. Barker 2002). These images and *Grevillea pauciflora*'s are now available at the website (Natural History Museum, London 2006). There are copies of the other five, which are not available in publications, in the State Herbarium of South Australia; these are not of high quality and were provided by the Natural History Museum in London for the State Herbarium's *Botanical Legacy* of 1802 display. There are also small black and white reproductions of all of the paintings in Mabberley & Moore (1999).

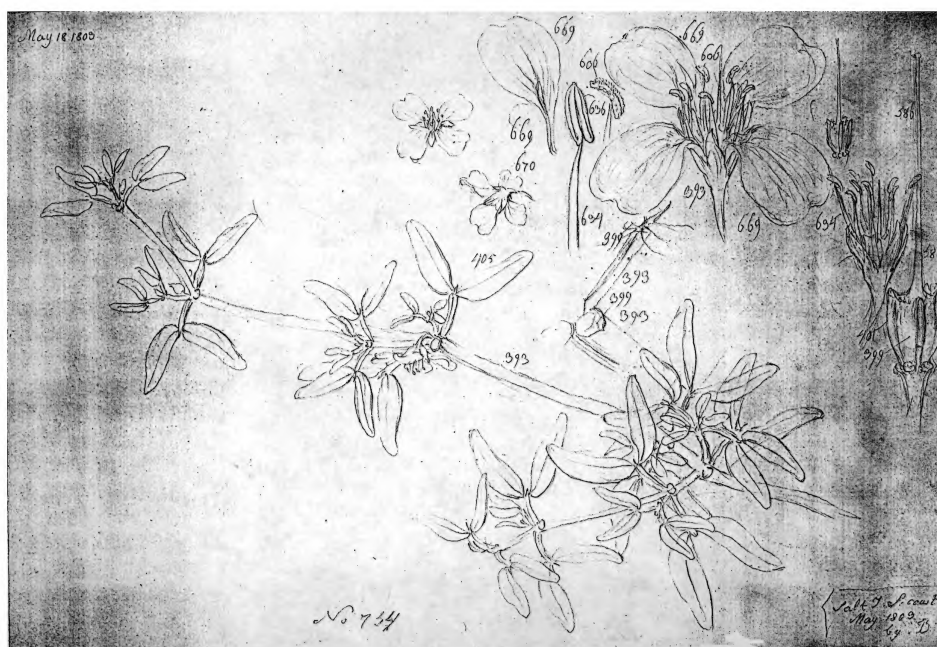


Fig. 13. Ferdinand Bauer's field drawing of *Zygophyllum billardierei* DC. in the Naturhistorisches Museum of Vienna. Note the economical use of paper, the numbers indicating the colour of each of the parts and the locality and date (Salt Island [Middle Island, Recherche Archipelago], South coast, May 1803) in the bottom right hand corner. The annotation 'No 754' is Bauer's field number for this illustration.

can be seen the annotation indicating that the drawing was made at Salt Island¹³ in 1803.

Illustrations in the field were composed on minimal paper since this was an extremely scarce commodity. Both Brown and Bauer experienced paper supply difficulties, with Brown sending numerous requests for supplies since there was none available in the colony and Bauer experiencing difficulties because much of his paper went mouldy in the tropics (Vallance et al. 2001 and Norst 1989). The drawing was colour coded with Bauer's numbers (for a discussion of Bauer's techniques see for example, Lack & Ibáñez 1997, Mabberley & Moore 1999), with these numbers being reproduced on the re-arranged and much larger "finished" drawing, prepared on the return to England.

There are other field drawings of South Australian and Australian plants by Bauer still in the Vienna Museum and Professor David Mabberley is presently working with Australian botanists to identify these.

Endlicher's publications of Bauer's drawings

After Bauer's death, the botanist Stephan Endlicher of the Naturhistorisches Museum of Vienna made use of many of Bauer's illustrations, publishing them as line drawings in his *Atakta botanica* (1833–35) and *Iconographia generum plantarum* (1837–41). Those listed below were based on specimens collected in South Australia. Bauer did not develop the last two as colour plates.

Dodonaea humilis Endl. (Memory Cove) (Fig. 14)

Sarcostemma viminalis (L.) R.Br. ssp. *australe* (R.Br.)

P.I. Forst. (St Francis Island) (Fig. 15)

Eremophila scoparia (R.Br.) F. Muell. (Mt Brown traverse) (Fig. 16)

Eremophila glabra (R.Br.) Ostenf. (Mt Brown traverse and/or Fowlers Bay) (Fig. 17)

Adenanthos terminalis R.Br. (Port Lincoln) (Fig. 18)

Choretrum glomeratum R.Br. (Memory Cove) (Fig. 19)

These plates were clearly based on Bauer's original field drawings but, just as Bauer rearranged his coloured illustrations (see above), the components of these, too, were often rearranged. This can be seen by comparing the line drawing of *Dodonaea humilis* in Endlicher's work (Fig. 14) with Bauer's original colour plate (Thomas 2002, Natural History Museum, London 2005; see also a small black and white image in Mabberley & Moore 1999).

¹³ Salt Island is now known as Middle Island. In the Recherche Archipelago, Western Australia, it is where salt was collected on the *Investigator*'s first visit in 1801. The drawing was made at the time of Bauer's second visit to the island on the rushed return trip to Sydney after the *Investigator* was found to be unsafe.

What can these collections tell us?

This listing of these early collections has reiterated a number of queries concerning the natural occurrence of certain plant species in South Australia and raised a few more.

Native plants sometimes considered to be weeds

Plants with prickles have a tendency to be regarded as non-native by members of the community and *Acacia paradoxa* DC. and *Solanum hystrix* R.Br. are no exception. Both species were first collected and named as a result of the Baudin and Flinders expeditions and both are clearly native to the state.

Heliotropium europaeum – from declared plant to native species?

Heliotropium europaeum L., previously treated as an introduction in South Australia (Robertson 1957, Craven 1986), has, since the discovery that it was collected by Robert Brown on Mt Brown in 1802,

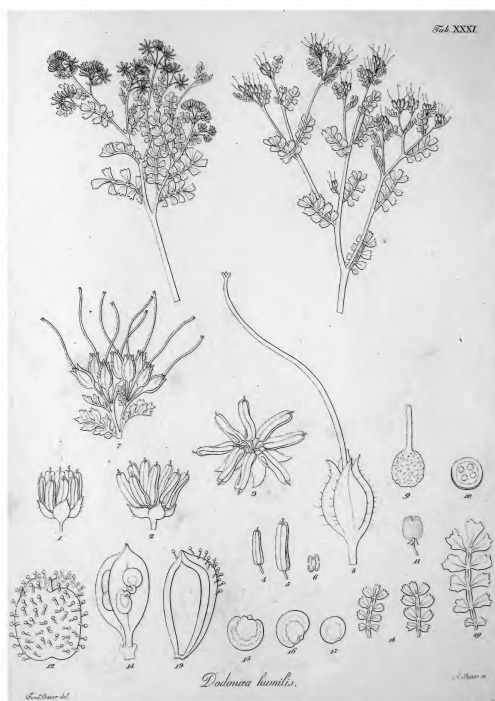


Fig. 14. *Dodonaea humilis* Endl. in Endlicher's *Atakta botanica*, t. 31. Drawn from material collected at Memory Cove. Endlicher published a number of plants using Bauer's drawings in the Naturhistorisches Museum of Vienna. There was considerable rearrangement of, and additions to, the dissected parts when compared with the Admiralty illustration now in the Natural History Museum in London (see Thomas 2002, p. 109 or Mabberley & Moore 1999, p. 103). Male (to left) and female (to right) branches are depicted here. (Reproduced from copy of book held by National Herbarium of Victoria).

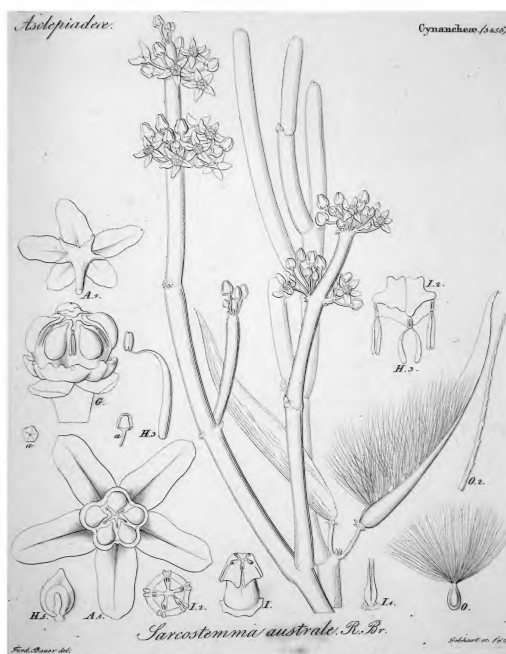


Fig. 15. *Sarcostemma viminalis* (L.) R.Br. ssp. *australe* (R.Br.) P.I. Forst. in Endlicher's *Iconographia generum plantarum* t. 64. Illustrated from material collected from St Francis Island. Endlicher used Bauer's illustration of this species in the Naturhistorisches Museum of Vienna. The same elements are very differently arranged when compared with the finished painting in the Natural History Museum in London (Mabberley & Moore 1999, p. 137). (Reproduced from copy of book held by National Herbarium of Victoria).

been considered native to the state (Craven 1996, W.R. Barker et al. 2005). For many years it was treated as a declared plant in South Australia, primarily because of its toxicity to sheep and cattle; it remains on the general list for Australia and the more specific lists for Western Australia and Tasmania (Navie 2004).

If it was an introduction, it is very difficult to account for its presence on Mt Brown. However, given the ability of this plant to spread, it is just possible that, as with *Salsola kali* (see below), it may have originated and spread from earlier undocumented arrivals of ships along the southern coast-line. Although poisonous, it has well-documented herbal uses and also is a common contaminant of crops, both possible explanations for its presence on board any ship. Animals carried on board these ships had to be fed and fodder could easily be contaminated with the seeds of this plant. Both *Heliotropium europaeum* and the next species, *Salsola kali*, were identified as plants growing on ballast deposits in the port of Philadelphia in the United States in 1876 (Martindale 1876). Or perhaps, a more prosaic explanation is that the Brown specimen has been wrongly labelled as to the locality of the collection. This is made more unlikely by the fact that there are two

extant specimens and Brown specifically mentioned it in the list he later compiled for Mt Brown. He clearly did not equate his own collection with *H. europaeum* since he gave it a new name.

Salsola kali – weed or native species?

Salsola kali L. has been variably documented in South Australia as a weed or a native species. Tate and J.M. Black implied, by their treatments (Tate 1890; Black 1909, 1924), that they considered the plant to be native while in the treatment in Jessop & Toelken (1986) it was considered an introduction. Eichler (1965) indicated that the specimens then in the State Herbarium belonged to various species and that a revision of the species was needed. He considered that var. *strobilifera* recognised by Bentham and applying to specimens from the north west of the state was probably a distinct species and also added another subspecies, ssp. *austroafricana* Aellen; material in the State Herbarium of South Australia (AD) of the latter taxon, native to southern Africa, was identified as such by the author of the subspecies. Wilson (1984) treated it as an introduction and it is frequently found in weed lists for Australia. *The Census of Vascular Plants of Victoria* (Victorian Plant Census



Fig. 16. *Eremophila scoparia* (R.Br.) F. Muell. (as *Pholidia scoparia* R.Br.) in Endlicher's *Iconographia generum plantarum* t. 66. Illustrated from material collected from Mt Brown. Endlicher used Bauer's illustration of this species in the Naturhistorisches Museum of Vienna but with a different arrangement of the dissected elements and considerable thinning of the branch when compared with Bauer's finished painting in the Natural History Museum in London (Mabberley & Moore 1999, p. 141). (Reproduced from copy of book held by National Herbarium of Victoria)

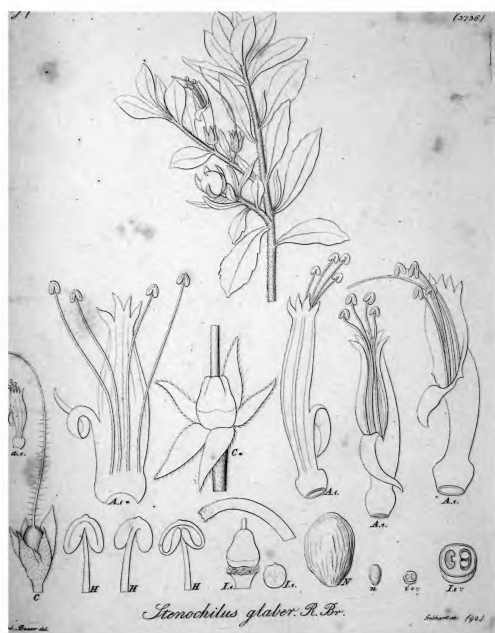


Fig. 17. *Eremophila glabra* (R.Br.) Ostenf. (as *Stenochilus glaber* R.Br.) in Endlicher's *Iconographia generum plantarum* t. 92. Illustrated from material collected from Fowlers Bay or from Mt Brown. Endlicher used Bauer's illustration of this species in the Naturhistorisches Museum of Vienna but with a different arrangement of the dissected elements and considerable shortening and thinning of the branch when compared with Bauer's finished painting in the Natural History Museum in London (Mabberley & Moore 1999, frontispiece and p. 141). (Reproduced from copy of book held by National Herbarium of Victoria)

2005) indicates that it is impossible to know whether the species is native or not, the New South Wales Census (Botanic Gardens Trust 2005) treats it as native and the Western Australian Census (Western Australian Herbarium 2005) treats *Salsola kali* (as *Salsola tragus* L.) as native.

Salsola was collected from St Francis Island by Robert Brown in 1802 (see Appendix 2). *Salsola kali* is rich in soda and was earlier used in making washing soda for both soap and glass manufacture; a common name of *Salsola kali* in Europe is 'prickly glasswort'. Before 1810 and the introduction of the Le Blanc method for extracting soda from salt, large quantities of the ashes of these plants were imported to England from southern Europe and northern Africa under the name of Barilla (a soda ash made by burning plants of *Salsola kali* and related species). The juice and fruits of *Salsola kali* were also used as a diuretic (Grieve 1931). Given its importance in these times there is the possibility of the introduction of *Salsola* to St Francis Island by Pieter Nuyts's ships in 1627 or by voyagers who landed there in the intervening period. Possible sources of



Fig. 18. *Adenanthes terminalis* R.Br. in Endlicher's *Iconographia generum plantarum* t. 110. Illustrated from material collected from Port Lincoln. Endlicher used Bauer's illustration of this species in the Naturhistorisches Museum of Vienna. *Adenanthes terminalis* is not represented in Bauer's finished painting in the Natural History Museum in London. (Reproduced from copy of book held by National Herbarium of Victoria)

introduction include ballast or fodder carried on ships or the deliberate carrying of seeds for planting because of useful properties, a practice which we have already seen was common to the British and French ships.¹⁴

Whether either of these plant species is native or not may be able to be determined from DNA studies but for the moment their status remains unclear.

Acacia cyclops – determining its natural distribution

Acacia cyclops A.Cunn. ex G.Don occurs naturally along the south western coastline of Western Australia through to the Nullarbor and Fowlers Bay, mostly in calcareous sand. The status of disjunct populations of *A. cyclops* on Kangaroo Island, Yorke and Fleurieu Peninsulas is unclear. It seems most likely that they are introduced populations since the the oldest collections in the State Herbarium of South Australia of the species from these localities date from 1945. This Herbarium also indicates that the species was being grown in Adelaide in the Botanic Gardens and in North Terrace Reserve in the 1920s, suggesting that recognition of

its horticultural value was already known. It has been heavily used in revegetation projects of the last forty or so years and is clearly spreading at the expense of native bush in some areas (e.g. Hallet Cove, personal observation).

Brown did collect *A. cyclops* from the southern coast of Australia, but only from King George Sound (Bennett 4351). He did not collect the species from anywhere in South Australia and so the early collections do not tell us whether the present day populations on Kangaroo Island and Yorke Peninsula are natural. The lack of any collections from the coastal localities visited by Brown, and by the French, suggest that it was not present at that time, and therefore the present day populations are not natural.

Other puzzling collections

There are undoubtedly other collections in the lists given below which will cause puzzlement. For example, *Acacia myrtifolia* is recorded from Mt Brown with an accompanying specimen by Robert Brown. However the species is unknown there today (M.O'Leary, pers. comm. May 2001; no collection in the State Herbarium of South Australia). Is the specimen misidentified or



Fig. 19 *Choretrum glomeratum* R.Br. in Endlicher's *Iconographia generum plantarum* t. 45. Illustrated from material collected from Memory Cove. Endlicher used Bauer's illustration of this species in the Naturhistorisches Museum of Vienna. *Choretrum glomeratum* is not represented in Bauer's finished painting in the Natural History Museum in London. (Reproduced from copy of book held by National Herbarium of Victoria)

¹⁴ See Peter Good's list of introductions to Kangaroo Island (Fig. 11) and Duyker & Duyker's (2001, pp. 38, 140) account of the attempts by the gardener Delahaye to establish a garden in Tasmania.

mis-labelled or did the species occur on Mt Brown 200 years ago?

Chenopodium glaucum L. is considered to be an introduction to South Australia (W.R. Barker et al. 2005). But according to the determinations on specimens in the Natural History Museum in London, Robert Brown collected it from Kangaroo Island in 1802. Is the identification correct? Will the status of this species need to be revisited in the future?

Robert Brown's collection of mudwort, *Limosella australis* R.Br., from Kangaroo Island in April 1802 is of interest. These plants are undercollected, but the only other collections of this species from the island are from Ravine des Casoars (*Eichler 15148*) in November 1958 and from Vivonne Bay (*W.R. Barker 8144 & S.D.Hopper*) in September 2000. Could this species have been found around the water supply where Good planted his alien seeds? Likewise Brown's collection of *Pleurosorus rutifolius* (R.Br.) Fee from Kangaroo Island; this is presently represented by only three collections in the State Herbarium of South Australia, none of them from the eastern end of the island.

Conclusion

This is the first attempt to draw together the botanical outcomes of the French and British voyages of discovery to South Australia in 1802–03. Although the lists produced will not be totally accurate and the French list is still incomplete, they form a base-line indication of the near-coastal vegetation of pre-European South Australia.

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APPENDIX 1 Plant collections by the French from South Australian waters in 1803: an interim list

The Baudin expedition was based on Kangaroo Island from 7 January to 1 February, 1803. For a discussion of just where they were anchored see Matheson (2001). Leschenault (in Péron & Freycinet's *Voyage de decouvertes...* vol. 2, p. 366) claimed to have discovered a great number of new species, and these were listed by Tate (1883) as including:

a *Nicotiana* growing on the sands by the sea shore, a *Melaleuca* with long filiform leaves, a *Melaleuca* with yellow flowers, many new species of *Eucalyptus*, a very pretty species of *Anthericum*, a plant of the order Irideae, a new species of *Solanum* and a *Convolvulus* without stem.

Similarly Tate records that Péron, the zoologist, wrote:

at the head of this grand bay [Nepean Bay] there are forests which appear to extend far away towards the interior, and which are composed of different species of *Eucalyptus*, *Banksia*, *Phebalium*, *Acacia*, *Casuarina*, *Metrosideros*, *Leptospermum*, *Styphelia*, *Conchium*, *Diosma*, *Hakea*, *Embothrium* etc.

A list is included here of those species which are now known to have been collected from Kangaroo Island and St Peter Island.

The basis for the list

Sources consulted include the SONNERAT database of the Muséum National d'Histoire Naturelle, Paris (P) (SONNERAT 2005), the de Candolle Herbarium of

the Conservatoire Botanique, Geneva (G) on microfiche in the Botanic Gardens and State Herbarium of South Australia library, the Australian Plant Name Index (APNI 2006), Péron's account of the voyage (Péron & Freycinet 1807–16), and the translation of Baudin's journal by Cornell (1974).

The source of the information is indicated after each species, although most are from the SONNERAT database, the search being conducted on 4 July 2005. The number beginning P00 is the number of the specimen in the database and the collector of the specimen is given as it appears in the database. A number of the specimens are housed under old names and these have been brought up to date where possible. However there is no guarantee that the identifications given in the database are correct. A number of specimens bear names of species that do not occur in the area and where this happens this is indicated in the notes following the species name.

Specimens annotated as coming from Île des Kangourous have been listed separately from those annotated as coming from Île Décres even though they are referring to the same place. The name of the island was contentious. Flinders had given it the name Kangaroo Island because of the number of kangaroos, but Baudin, after mapping the greater part of the island, decided that he should have the honour of naming it (Cooper 1952, p. 80; Cornell 1974) and used the name Île Borda, in honour of Jean Charles Borda, a French mathematician. After Baudin died at Mauritius on the return journey, Péron, and then Freycinet, wrote up and published the outcomes of the expedition (Péron & Freycinet 1807–16). In this account, the name of the island was changed to Île Décres, in honour of the French Minister of Marine. French specimens

have been seen which have been annotated with either Île des Kangourous or Île Décres (there seem to be fewer of the latter) but none with Île Borda. Even though the collections from Île Décres are mostly anonymous with respect to collector, the use of this name was presumably confined to those associated with the Baudin voyage.

Specimens listed as being collected from St Francis Island by members of the Baudin expedition are erroneously labelled. At the time there was some confusion on board as to their locality (Cornell 1974) and specimens were attributed to St Francis Island when they should have been attributed to St Peter Island or possibly the mainland adjacent to it. In the St Peter Islands between 7th and 11th February 1803 (Cornell 1974), only Baudin's party in the *Géographe* anchored and made collections for at least one or two days in that time; Freycinet in the *Casuarina* did spend time in the area but was unable to find an anchorage.

Kangaroo Island (as Île des Kangourous) (7 January – 1 February, 1803)

- Acacia paradoxa* DC. (P00293911, P00293912, P00293913 – Baudin).
- Acacia dodonaeifolia* (Pers.) Balb. (P00293880: as 'dodoniiifolia' – Baudin; P00293881: as 'dodoniiifolia' – Anon.).
- Acrotriche ovalifolia* R.Br. (P00256438 – Anon.) = *Acrotriche cordata* (Labill.) R.Br.
- Atriplex paludosa* R.Br. ssp. *baudinii* (Moq.) Aellen (P00256035 – Anon.) = *A. paludosa* ssp. *cordata* (Benth.) Aellen
- Atriplex* sp. (P00256037 – Anon.). There are at least 5 species of *Atriplex* on Kangaroo Island.
- Bulbine semibarbata* (R.Br.) Haw. (P00298229 – Anon; P00298230 – Baudin).
- Casuarina stricta* Miq. (P00230058, P00230014 – Baudin) = *Allocasuarina verticillata* (Lam.) L.A.S. Johnson
- Convolvulus acaulis* Choisy (P00256180 – Leschenault) = type gathering of species.
- Correa* sp. (P00337623, P00337621 Baudin). There are six species of *Correa* presently recognised for Kangaroo Island (W.R. Barker et al. 2005).
- Correa alba* Andrews (P00337618 – Baudin). Of the six species of *Correa* presently recognised for Kangaroo Island, this is not one. It may be wrongly identified but *C. alba* is recorded for the adjacent Southern Lofty region (W.R. Barker et al. 2005).
- Eucalyptus amygdylina* Labill. (P00291907 – Baudin). This is a Tasmanian endemic species and so the specimen is either wrongly named or has an erroneous locality. Fruiting specimens may have been confused with *E. baxteri* (Benth.) Maiden & Blakely which does occur on the island.
- Eucalyptus cneorifolia* DC. (P00291915, P00291913 – both attributed to Guichenot; P00291912 – Baudin)
- Eucalyptus diversifolia* Bonpl. (P00291916 – Anon.).
- Eucalyptus obtusiflora* DC. (P00291935 Baudin). This is a Western Australian endemic species and so once again the specimen is either wrongly named or has an erroneous locality. Fruiting specimens may have been confused with *E. leucoxydon* F.Muell. which does occur on the island.
- Eurybia linearifolia* DC. (P00270028, P00270028 – Anon.) = *Olearia axillaris* (DC.) F.Muell. ex Benth.
- Leucophyta brownii* Cass. from Kangaroo Island (pers. comm. Philip Short)
- Leucopogon microphyllus* R.Br. (P00256416 – Anon.). This is the name of an eastern states of Australia species. There are 7 species of *Leucopogon* on Kangaroo

Island. The most likely species, since it is common and coastal, is *Leucopogon parviflorus* (Andrews) Lindl.

Melaleuca nodosa Sm. (P00291940, P00291941 – Baudin). This species is found only in New South Wales and Queensland and is presumably wrongly named. *Melaleuca lanceolata* Otto is the most likely species to have been collected.

Melaleuca sp. (P00291961, P00291960 – Anon.). There are at least 10 *Melaleuca* species on Kangaroo Island (W.R. Barker et al. 2005).

Myoporum tuberculatum R.Br. (P00256116 Baudin; P00256117, P00256118 – Anon.) This name is currently not in use for Australian collections. The species could be any one of the three species of *Myoporum* occurring on Kangaroo Island, but *M. insulare* R.Br. is the one most likely to be encountered in coastal areas.

Nicotiana maritima H.-M. Wheeler (P00256131 – Baudin).

Nicotiana australis R.Br. (P00256129 – Anon; P00256130 – Leschenault): usually treated as synonymous with *N. velutina* H.-M. Wheeler (see Purdie et al. 1982). *N. velutina* is an arid species of *Nicotiana* and so this specimen is either wrongly identified or has an erroneous locality. *N. maritima* is the only species recorded for Kangaroo Island (W.R. Barker et al. 2005).

Orthrosanthus multiflorus Sweet (not listed in SONNERAT but mentioned under *Sisyrinchium cyaneum* in Lindley (1827) as having been collected by both the British and the French, but without fruits (see Fig. 10).

Pimelea serpyllifolia R.Br. (P00235912 – Baudin).

Pimelea sp. (P00235936 – Anon.). There are 8 species of *Pimelea* recorded for Kangaroo Island (W.R. Barker et al. 2005).

Senecio crithmifolius A.Rich. (P00272114 – Baudin) probably *S. pinnatifolius* – see Belcher (1994)

Senecio odoratus (P00272125 – Anon.).

Solanum aviculare ssp. *fasciculatum* (P00256165 – Anon.). One of the Kangaroo apples. *S. capsiciforme*, *S. symonii* and *S. laciniatum* are recorded from the island, although the last of these is not usually thought to be native there (Symon 1994).

Solanum symonii Eichler (P00256141 – Baudin).

Vittadinia sp. (P00270035 – Anon.). There are three species native to the island and all are reasonably common.

Kangaroo Island (as Île Décres)

Agonis linearifolia (DC.) Sweet as *Leptospermum linearifolia* DC. Île Décres is cited in the protologue as the type locality. This is assumed to be a misplacement of labels as this WA species does not occur on Kangaroo Island.

Senecio odoratus Hornem. (P00262366 – Baudin; P00262357 – Anon).

Senecio sp. (P00262356 – Anon.).

Melaleuca armillaris Sm. (P00291959 – Anon.). This species occurs on Kangaroo Island as a recent introduction only. See comments above re *Melaleuca*.

Eucalyptus oraria L.A.S. Johnson (det. Brooker 1977) (P00291899 – "Île Décres (côte occidentale)"). *E. oraria* is an endemic Western Australian species and so this identification is incorrect. The specimen may well be *E. cneorifolia* DC. which is from the same systematic group (Brooker et al. 2002).

Callistemon viridiflorus Sims (P00291965 – Anon.) – this species does not occur on Kangaroo Island. It is more likely to be *Callistemon rugulosus* (D.F.K. Schltdl. ex Link) DC. if it comes from Kangaroo Island (W.R. Barker et al. 2005).

St Peter Island (during 7 – 11 February 1803)

Acacia anceps DC. (P00293908 – Côte occidentale, Ile St Pierre). The type of *A. anceps* is attributed to Leschenault from this locality or the adjacent mainland; see Maslin & Whibley 1987. A second specimen, P00293909, is merely attributed to “Côte occidentale” [West Coast]. In the protologue the specimen is attributed to “orâ orientali [East coast] (v.s. ex Mus. Par.)”. *A. anceps* is confined to the southern coast-line from Recherche Archipelago to Yorke Peninsula. The locality St Pierre has presumably been added in more

recent times since other specimens from the Baudin collection are invariably labelled as coming from St Francis Island (see below).

Beyeria lechenaultii (DC.) Baill. (as St Francis Island). From the protologue (Fig. 1).

Leucophyta brownii Cass. (as St Francis Island). Information pers. comm. Philip Short (DNA).

Frankenia fruticulosa DC. (as St Francis Island). From the protologue, reproduced in APNI (2006).

Myoporum brevipes Benth. (P00256103 – “Île St François”, Anon. – determined by R.J. Chinnock, May 1989).

APPENDIX 2

Plant collections by the British from South Australian waters in 1802

Produced below are lists of the plants collected at each of the South Australian localities where collections were possible.

The basis for the lists

The lists primarily come from a search of the database of Robert Brown's collections (Robert Brown Database 2001) maintained by the Western Australian Herbarium (PERTH) and the Natural History Museum, London (BM). Since the identifications of these plants are not always correct, notes are often provided with each species listed. Also listed is Robert Brown's manuscript name given to the species at the time, since this has helped in determining the identity of a number of Peter Good's seed collections; these have also been given for each of the landings. Many of the collections are types and Bauer illustrated some of them. This information also appears where relevant.

For background purposes a summary of Robert Brown's (Vallance et al. 2001) and Peter Good's (Edwards 1981) diary descriptions for each of the landings has also been included.

Since the localities visited were yet to be named they were allocated a Roman numeral by Brown (see Table 2 and Fig. 4) and it is these which appear on the labels of the plant collections. These numerals are preceded by “Bay” or “Anchorage”. Memory Cove and Kangaroo Island were named at the time of the visit and these are also found on the labels of some specimens. Flinders' own map (Flinders 1814) or the maps in Vallance et al. (2001) offer more detailed information for each of these areas.

Bay III, Fowlers Bay (29 January 1802)

the most miserable part of the coast we had landed on.

Peter Good (Edwards 1981)

29th January. Brown went ashore at 5 a.m. and walked about a mile parallel to the beach. He commented that it was one of the most barren spots that he had seen, although he found a few new plants, plus several out of season. He caught a small quadruped – thought to be the Western Barred bandicoot, which Bauer drew at this locality. He commented on the tide rising to a considerable height as judged by the *Zostera* thrown on the beach by up to 6 feet above sea level and because of shells found 50 yards into the bush.

Amongst his collections he listed two new ants, shells, sponges, pied haemotopus (Pied Oystercatcher), a duck, two waders and possibly a honey-eater.

Good's account parallels Brown's and so it is likely they went ashore together. He records ascending the neck of land which shelters the bay and since a few new plants were found they directed themselves to the flat low country inland which was covered with salt. Good recorded that this was the only part of the mainland where none of the bushes had been set on fire, commenting that it would have been difficult to do so since the plants were so “thin scattered”.

They set sail again at 1 p.m.

Brown's collections from Bay III (Fowler's Bay) still extant

Cratystylis conocephala (F. Muell.) S. Moore (Bennett 2307)

Dodonaea stenozygia F. Muell. (Bennett 5443 p.p.)

Eremophila glabra (R. Br.) Ostenf. (Bennett 2338 p.p.) – as *Stenochilus glaber* R. Br. Endlicher's use of Bauer's illustration of *E. glabra* from this locality or from Mt Brown in the Naturhistorisches Museum of Vienna is shown in Fig. 17. The finished painting in the Natural History Museum in London is shown in Mabberley & Moore (1999) and on their website (Natural History Museum, London 2006).

Eucalyptus oleosa F. Muell. (Bennett 4772)

Eucalyptus rugosa R. Br. ex Blakely (Bennett 4764 p.p.)

Frankenia sessilis Summerh. (Bennett 5199) [Brown's annotation: *Frankenia dealbata*]

Goodia pubescens Sims (Bennett 4241 p.p.) = *Goodia medicaginea* F. Muell. [Brown's annotation: *Platylobioides hedysarifolia/Cystisoides*]

Goodenia varia R. Br. (Bennett 2518 p.p.). Lectotype collection (see Carolin 1990). Also collected from St Peter Island, Thistle Island and Memory Cove.

Halosarcia indica (Willd.) Paul G. Wilson subsp. *leiostachya* (Benth.) Paul G. Wilson (Bennett s.n.) [Brown's annotation: *Salicornia indica*]

Halosarcia pterigosperma (J. Black) Paul G. Wilson (Bennett 3080) [Brown's annotation: *Salicornia australis*]

Lawrenzia squamata Nees ex. Miq. (Bennett 4998 p.p.) [Brown's annotation: *Sidioides microphylla*]

Myoporum ellipticum (Bennett 2802 p.p.) = *M. insulare* R. Br. (pers. comm. R.J. Chinnock, August 2006) [Brown's annotation: *Myoporum caecum*]

Myoporum humile R. Br. = *M. parvifolium* R. Br. (Bennett 2791 p.p.) Part of type gathering of *M. humile* R. Br.

Nitraria billardierei DC. (Bennett 5346 p.p.) – the illustration of this species by Bauer which was later worked up into a completed painting (Mabberley &

- Moore 1999, p. 99) was based on a later collection from Goose Island Bay in May 1803. [Brown's annotation: *Nitraria australis*]
- Pannaria rubiginosa* (Thunb. ex Ach.) Del. – a lichen (Bennett 556)
- Pittosporum phylliraeoides* DC. (Bennett 5447) = *P. angustifolium* Lodd. [Brown's annotation: *Pittosporum angustifolium*]
- Samolus repens* (Forst. & Forst.f.) Pers. (Bennett 2817 p.p.) [Brown's annotation: *Samolus umbellatus*]
- Santalum acuminatum* (R.Br.) A.D.C. (Bennett 3214 p.p.) – part of type gathering of *Fusanus acuminata* R.Br. [Brown's annotation: *Fusanoides lanceolatum*]
- Scaevola spinescens* R.Br. (Bennett 2573 p.p.). Type gathering; see *Flora of Australia* 35: 97 (1992). Drawn by Bauer from material collected here and at St Francis Island, q.v.; a black and white rendition of the completed watercolour in the Natural History Museum, London can be seen in Mabberley & Moore (1999, p. 130) and a low resolution colour reproduction is held by the State Herbarium of South Australia.
- Suaeda maritima* (L.) Dumort. = *Suaeda australis* (R.Br.) Moq. (Bennett 3032) [Brown's annotation: *Chenopodium angustifolium*]
- Westringia dampieri* R.Br. (Bennett 2383 p.p.) – part of type of *W. cinerea* R.Br. [Brown's annotation: *Westringia cinerea*]
- Westringia rigida* R.Br. (Bennett 2382) – ?type gathering of *W. rigida* R.Br.

Peter Good's seed list from Bay III

- Myoporum* [caecum ?] [*Myoporum insulare* R.Br.]
- Atriplex dioica* [possibly *A. paludosa* R.Br., later referred to by Brown as *Atriplex reniformis* (male)]
- Croton viscidum* [? *Beyeria lechenaultii* (DC.) Baill.]
- Mimosa spathulata* [*Acacia* sp.]
- Rutae: Gen: an nov! [perhaps *Geijera*]
- Nov Gen Syngen: flor non vis [usually referred to a composite]
- Nov Gen didym: angiosp: [possibly *Stenochilus* – now *Eremophila*, or *Goodia* – *didynamia* refers to 4 stamens with two of them longer than the other two]
- Myoporum floridum* [? *M. parvifolium* R.Br.]
- Pittosporum* [*Pittosporum angustifolium* Lodd.]
- Samolus littoralis* var [*Samolus repens* (J.R.Forst. & G.Forst.) Pers. – collected by Brown (Bennett 2817 p.p.) from Bay X under this name]
- Nov Gen stam 15 Drup super monosp [*Lawrencia squamata* Nees would fit this description of a new genus with 15 stamens and the fruit superior and 1-seeded]
- Westringia rigida* [Brown collected this and his collection, Bennett 2382, is the type of *W. rigida*]

Bay IV, St Francis Island (2–4 and 8–9 February 1802)

3rd February. Anchored in Petrel Bay off the north side of the island. In the morning Brown and Good at least, walked to the opposite side of the island – both commenting on the burrows of the mutton birds and a sharp grass which ran into their legs. The heat was excessive. Brown returned to shore in the evening while mutton birds were being captured for food.

4th February. Brown and Good both remain aboard ship.

8th February. Good went ashore on the second visit and traversed a different portion of the island, commenting

on being equally as unsuccessful as on the first visit. Brown did not leave the ship. Bauer illustrated *Enchylaena tomentosa* and *Sarcostemma australe* from this anchorage.

Brown's collections from Bay IV (St Francis Island) still extant

- Acacia oswaldi* F.Muell. (Bennett 4337) [Brown's annotation: *Mimosa mucronata*]
- Acrotriche patula* R.Br. (Bennett 2470). Type collection of species. [Brown's annotation: *Styphelia patula*]
- Angianthus tomentosa* Wendl. (Bennett 2137) [Brown's annotation: *Novum genus Corymbifer*]
- Correa* sp. (Bennett 5314) identity uncertain because of the state of taxonomy of *Correa*. [Brown's annotation: *Correa alba*]
- Dissocarpus biflorus* F.Muell. (Bennett 3075). Type collection of *Sclerolaena biflora* R.Br. [Brown's annotation: *Salsoloides incana*]
- Dodonaea viscosa* Jacq. (Bennett 5435 p.p.)
- Enchylaena tomentosa* R.Br. (Bennett 3036). Type collection of species. Drawn by Bauer from material collected here. A black and white rendition of the completed painting in the Natural History Museum, London can be seen in Mabberley & Moore (1999, p. 145) and a low resolution colour reproduction is held by the State Herbarium of South Australia.
- Eremophila glabra* (R.Br.) Ostenf. (Bennett 2338 p.p.)
- Lawrencia glomerata* Benth. (Bennett 5103). [Brown's annotation: *Sida insularis*]
- Lawrencia squamata* Nees ex. Miq. (Bennett 4998 p.p.) [Brown's annotation: *Sidoides microphylla*]
- Olearia axillaris* (DC.) F.Muell. ex Benth. (Bennett 2247 p.p.) [Brown's annotation: *Aster gnapholodes*]
- Pimelea microcephala* R.Br. (Bennett 3165). Type collection of species. [Brown's annotation: *Pimelea breviceps*]
- Pimelea serpyllifolia* R.Br. (Bennett 3178 p.p.). Type collection of species. [Brown's annotation: *Pimelea parvifolia*]
- Salsola kali* L. (Dryander dupl., of Bennett 3081?) [Brown's annotation: *Salsola australis*] – this name may need to be changed to *Salsola tragus* L. (see notes on this species above).
- Sarcostemma viminale* (L.) R.Br. subsp. *australe* (R.Br.) P.I. Forst. (Bennett 2872) [Brown's annotation: *Cynanchum aphyllum* B[anks] & S[olander]/*Cyn viminale* L.] Type gathering of *Sarcostemma australe* R.Br. Completed watercolour by Ferdinand Bauer in Natural History Museum, London (see Mabberley & Moore 1999, p. 137); a low resolution colour reproduction is held by the State Herbarium of South Australia. Endlicher's reproduction of Bauer's drawing can be seen in Fig. 15.
- Sclerolaena uniflora* R.Br. (Bennett 3076). Type collection of species. [Brown's annotation: *Salsoloides*]
- Westringia dampieri* R.Br. (Bennett 2383 p.p.). This specimen is apparently the lectotype of *W. cinerea* R.Br., now a synonym of *W. dampieri* R.Br.

Peter Good's seed list from Bay IV

- Cynanchium aphyllum* [*Sarcostemma viminale* (L.) R.Br. subsp. *australe* (R.Br.) P.I. Forst. Brown's collection of this (Bennett 2872) bears this name]
- Westringia angustifolia* [*Westringia dampieri* R.Br. or part of that complex. Bennett 2383, see above, has this name on it] – successfully grown in Kew Gardens.
- Lepidium insulare* afr L. *diffusum* Sol. [*Lepidium* sp. – no extant Brown specimen]

- Cartodium? Nov. sp. [? *Angianthus tomentosa* Wendl., although most species that Brown referred to Cartodium were *Calocephalus*, suggesting this might also be *C. brownii*. However *Angianthus tomentosa* seed was successfully grown at Kew Gardens as *Cassinia aurea* R.Br. and attributed to Good's collection].
- Festuca pungens* not ripe [*Triodia irritans* R.Br.]
- Sida* [*Lawrencia* sp. – two species were collected by Brown from Bay IV, with *L. squamata* annotated as *Sidoides microphylla* and *L. glomerata* as *Sida insularis* by Brown]
- Apium anver* A. prostratum [presumably *Apium prostratum*, although no Brown collections are extant from here]
- Nov Gen Didym Angiosp: idem B III [a new genus, also collected at Bay III – almost certainly *Eremophila* with 4 stamens in unequal pairs]
- Mimosa mucronata* [Brown's collection of *Acacia oswaldii* F.Muell. (Bennett 4337) is annotated with this name]

Bay V, St Peter Island (6–7 February 1802)

6th February. Anchored in the evening off the northern side of Goat Island at its eastern end.

7th February. At 6 a.m. Brown and Good landed on St Peter Island and set off in a north-easterly direction for about 2 miles, then headed towards the beach. Brown became separated from the rest of the party “the heat being intolerable & pretty well loaded I found myself much more exhausted than I had done in any of my expeditions in this country” (Vallance et al. 2001, p. 127). Brown eventually reached the beach and some shade. He had lost all sense of direction and after resting, initially set off in the wrong direction for the boat. On returning to his resting place he finally had to climb up from the beach to get a sight of the boat, 4 miles away. On the return he had to walk nearly knee deep in water for an hour and a half before meeting the boat which had been sent out to meet him [in the text it says “us” – indicating that he may not have been alone].

Good was back on board by 1 p.m. Bauer was on Goat Island with Flinders.

On this island we found no water: It is generally thinly covered with shrubs, the *Pittosporum glaucum* [presumably the familiar *Pittosporum phillyreoides*, now known as *P. angustifolium*] being the only tree we saw & that seldom exceeding 10 feet. The plants were nearly the same as those observed at No III [Fowlers Bay] but here there was less variety. Some spots here and there were occupied by grass which grew in tufts distant from each other, a space scarce more than their own size which was generally about 10 inches Diameter [presumably *Triodia irritans*, the type of which was collected from here].

From Brown's diary. (quoted in Vallance et al. 2001, p. 128).

Brown's collections from Bay V (St Peter Island) still extant

- Atriplex pumilio* R.Br. (Bennett 3024 p.p.) Type gathering of *A. pumilio* R.Br.
- Atriplex paludosa* R.Br. [possibly collected by Flinders from here (see Vallance et al. p. 129). Referred to by Flinders as *Atriplex reniformis* of Brown and represented by Bennett 3027 which is here attributed to Kangaroo Island]

Goodenia varia R.Br. (Bennett 2518 p.p.). Part of type gathering.

Pittosporum sp.; presumably what is now known as *P. angustifolium*: mentioned by Brown in his diary but not mentioned on a specimen of this (Bennett 5447), which is attributed to Anchorage III

Solanum hystrix R.Br. (Bennett 2677) Type collection. Drawn by Bauer; the completed painting is shown on the Natural History Museum, London (2002) website and in Thomas (2002, p. 57). A low resolution colour reproduction is held by the State Herbarium of South Australia.

Scaevola spinescens R.Br. (Bennett 2573 p.p.). Part of type gathering. Drawn by Bauer from material collected here and at Fowlers Bay (Bay III) q.v. A black and white rendition of the completed watercolour in the Natural History Museum, London can be seen in Mabberley & Moore (1999, p. 130); a low resolution colour reproduction is held by the State Herbarium of South Australia.

Triodia irritans R.Br. (Bennett 6258). Type gathering.

Peter Good's seed list for Bay V

Pittosporum nov sp idem Bay III [*Pittosporum angustifolium*]

Alyxia buxifolia [*Alyxia buxifolia* R.Br. – not recorded as being collected by Brown from SA, but it was collected along the southern coast from all of the other states (Bennett 2854)]

Syngenis: fol lanat [leaves woolly, stamens joined – ?does not really apply to any of species in list, but Syngenesia was the Linnaean method or reference to a composite]

Anchorage VI, Waldegrave Island (11 February 1802)

11th February. No new plants were recorded, but 21 species were observed, including mosses and excluding algae. Ten to twelve species of algae were noted. Mutton birds were common, together with some Cape Barren geese and rats. An abundance of seals was recorded.

Extant plant specimens

It would appear that so many of the specimens here were the same as those already encountered that Brown and Good may not have made any real effort to collect either pressed specimens or seeds. There is only one Brown collection in the database and no seed list for this location. The algal species noted appear not to be represented by collections in the Natural History Museum, London.

Westringia dampieri R.Br. (Bennett 2383 p.p.). Type of *Westringia cinerea* R.Br.

Anchorage VII, Flinders Island, Investigator Group (13 February 1802)

Brown records landing at 8 a.m. on the beach. He walked about half a mile in a southerly direction, then south-east, then north-east, to arrive at the beach at the eastern end of island. He recorded a fern, *Casuarina* and *Melaleuca*, the species all previously observed. A large numbers of Tammam Wallabies and seals were seen.

Traversed the greater part of the island according to Good.

Brown's collections from Anchorage VII (Flinders Island) still extant

Allocasuarina sp. (Bennett 3141). According to L.A.S. Johnson (1989, p. 200) the specimen, which is the type of *Casuarina bicuspidata* Benth., is *A. trichodon* (Miq.) L.A.S. Johnson which is confined to Western Australia. It was suggested that the locality data on the label must be erroneous.

Lasiopetalum discolor Hook. (Bennett 5165 p.p.). [Brown's annotation: *Lasiopetalum bracteatum*]

Westringia dampieri R.Br. (Bennett 2383 p.p.). Type of *Westringia cinerea* R.Br.

Peter Good's seed list for Bay VII

Astragalus [Leguminous plant – none listed in Brown's collections from here]

Mimosa spinosissima [*Acacia paradoxa* DC. Not included in Brown's extant collections from this locality, but collected at Bay IX and annotated with this name.]

Anchorage VIII, Thistle Island (21 February 1802)

21st February. Brown went ashore at 6 a.m. He walked a mile towards the middle of the island, then to a salt lagoon and returned via the beach. He was back on board by 12.30 p.m. He recorded it as a well-wooded island of *Casuarina equisetifolioides* [*Allocasuarina verticillata*], *Melaleuca albiflora* [*M. lanceolata*], *Eucalyptus* sp. and *Pittosporum*. Mangroves [*Avicennia*] were seen in several places and a tufted grass [*Themeda* or any others] as on Flinders Island.

He saw Tammar Wallaby and brushtail possum, one Carpet Python, 7 feet 9 inches long, and others which were smaller.

They were back on board ship by noon, according to Good.

The cutter went off with the Master, Mr Thistle, midshipman, Mr Taylor and 6 crew to map the coastline. They were seen to be returning on dusk when the cutter disappeared from sight.

Brown's collections from Anchorage VIII (Thistle Island) still extant

Atriplex prostrata R.Br. (Bennett 3024 p.p. as 2324) = *A. pumilio* R.Br.

Eucalyptus viminalis Sm. (Bennett 4744 p.p.) This is presumably ssp. *cygnetensis* Boomsma (W.R. Barker et al. 2005).

Eutaxia microphylla (R.Br.) J.Black (Bennett 4090). Type of *Sclerotheramnus microphyllus* R.Br. [Brown's annotation: *Oplocharis microphylla*]

Exocarpos aphyllus R.Br. (Bennett 3203 p.p.). Part of type gathering of this species.

Goodenia varia R.Br. (Bennett 2518 p.p.). Part of type gathering.

Ixodia achilleoides R.Br. (Bennett 2147 p.p.) [Brown's annotation: Gen nov prope ...]

Lasiopetalum discolor Hook. (Bennett 5165 p.p.). [Brown's annotation: *Lasiopetalum bracteatum*]

Myoporum humile R.Br. = *M. parvifolium* R.Br. (Bennett 2791 p.p.) Part of type gathering of *M. humile* R.Br.

Pomaderris racemosa Hook. (Bennett 5369 p.p.) [Brown's annotation: *Ceanothus tomentosa*]

Peter Good's seed list for Bay VIII

Legum: leg 1 sperm: fl not seen [*Eutaxia microphylla* (R.Br.) J.Black]

Umbellat [perhaps *Apium prostratum*, but possibly also species of *Hydrocotyle*, *Centella* or *Xanthosia*]

Scleria ensis [Scleria is a Cyperaceous genus, but this name was not used by Brown for any South Coast specimens. He did describe a number of species within *Scleranthus*, *Sclerolaena* and *Sclerotheramnus*]

Myoporum caecum caule arbor [tree Myoporum: *M. insulare* – see previously]

Bay IX, Memory Cove (22–25 February 1802)

22nd February. The crew searched for the cutter lost on the previous evening, Brown and party (including Good) working north west along the shore in the opposite direction to Flinders party. Despite this search for the cutter and its crew they still found about 20 new plants. A Port Lincoln Ringneck [*Barnardius zonarius*] was shot by Mr Bell, the surgeon, and later drawn by Ferdinand Bauer. Native huts were seen.

23rd February. Brown and Good climbed to the top of the hill west of the ship after breakfast. They walked down the opposite side of the hill and returned to the ship through a recently burnt valley. They recorded a further 6–7 plants and 3 more specimens of Port Lincoln parrot. The beach was reached at 4 p.m.

24th February. Good returned to cover the same ground as on the 22nd while Brown remained on board arranging and describing plants. He described 13 plants on this day.

25th February. A copper inscription commemorating the loss of the crew was affixed to a tree in Memory Cove before departure at 9.30 a.m.

Brown's collections from Bay IX (Memory Cove) still extant

Acacia acinacea Lindl. (Bennett 4344). Possibly *A. halliana* Maslin, since *A. acinacea* does not occur here. [Brown's annotation: *Mimosa intermedia*]

Acacia dodonaeifolia (Pers.) Balb. (Bennett 4341 p.p.). [Brown's annotation: *Mimosa fucata*]

Acacia falcata Willd. (Bennett 4350) Identification to be checked – not a South Australian species. [Brown's annotation: *Mimosa paniculata*]

Acacia latifolia Benth. var. (Bennett 4276) – Identification to be checked since this is a northern tropical species with flat leaves and flowers in long spikes. Probably *A. longifolia* (Andrews) Willd. ssp. *sophorae* (Labill.) Court (see Whibley & Symon 1992).

Acacia myrtifolia (Sm.) Willd. (Bennett 4347 p.p.)

Acacia salicina Lindl. (Bennett 4338 p.p.) Identification possibly not correct as this species is not recorded for the area; (Whibley & Symon 1992). [Brown's annotation: *Mimosa pedunculata*]

Acacia armata R.Br. ex Aiton (Bennett 4313 p.p.) = *Acacia paradoxa* DC. Part of type gathering of *A. armata* R.Br. ex Aiton. [Brown's annotation: *Mimosa spinosissima*]

Acacia juniperina (Vent.) Willd. (Bennett 4296). This is an eastern state species now known as *A. ulicifolia* (Salisb.) Court. The species is most likely to be *A. rupicola* F.Muell. ex Benth. since this has similar

- phyllodes and flowers (Maslin 2001) and furthermore is viscid (Whibley & Symon (1992), thus complying with Brown's manuscript name of *Mimosa viscosa*.
- Acacia retinodes* Schltdl. (Bennett 4348) [Brown's annotation: *Mimosa* no. 2]
- Acacia spinescens* Benth. (Bennett 4316 p.p.) [Brown's annotation: *Mimosa* ?aphylla]
- Acaena ovina* A.Cunn. ? = *A. echinata* Nees (Bennett 4391 p.p.). On present day concepts *A. ovina* does not occur here (W.R. Barker et al. 2005) [Brown's annotation: *Acaena interrupta*/Ancistrum latebrosum]
- Adriana klotzchii* Müll.Arg. = *A. quadripartita* (Labill.)Müll.Arg. (Bennett 3585 p.p.)
- Apalochlamys spectabilis* (Labill.)Steud. (Bennett 2153) [Brown's annotation: Genus Syngense]
- Astroloma humifusum* (Cav.)R.Br. (Bennett 2405) [Brown's annotation: *Styphelia denticulata*/coccinea]
- Beyeria opaca* F.Muell. (Bennett 3586 p.p.) Almost certainly *Beyeria lechenaultii* (DC.)Baill. [Brown's annotation: *Crotonoides dyalifolia*]
- Bulbine semibarata* (R.Br.)Haw. Leek Lily. (Bennett 5675 p.p.)
- Bursaria spinosa* Cav. (Bennett 5457 p.p.)
- Cassinia spectabilis* R.Br. (Bennett 2153). Type collection of species (Labelled as 'Genus Syngense and 'Genus Nova' by Brown.)
- Choretrum glomeratum* R.Br. (Bennett 3211). Type gathering of species. Bauer's line-drawing of this species in Endlicher's *Iconographia* (1838: t. 45) is shown in Fig. 19. [Brown's annotation: *Corethrium glomeratum*]
- Chrysocephalum apiculatum* (Labill.)Steetz (Bennett 2180) [Brown's annotation: *Gnaphalium*]
- Correa* sp. (Bennett 5311) [Brown's annotation: *Correa varia*]
- Correa* sp. (Bennett 5320 p.p.): [Brown's annotation: *Correa glabra*]
- Dodonaea humilis* Endl. (Bennett 5442). [Brown's annotation: *Dodonaea aptera*] Type is based on illustration in Endlicher's (1834) *Atakta Botanika*, which is based on Bauer's original drawing in the Naturhistorisches Museum of Vienna. Bauer's line-drawing in Endlicher's *Atakta botanica* t. 31 is reproduced here as Fig. 14. Bauer's original worked plate can be seen on the Natural History Museum, London (2006) website.
- Dodonaea viscosa* Jacq. subsp. *spatulata* (Sm.)J.West (Bennett 5438)
- Exocarpos aphyllus* R.Br. (Bennett 3203 p.p.). Part of type gathering of this species.
- Exocarpos cupressiformis* Labill. (Bennett 3207 p.p.)
- Eucalyptus angulosa* Schauer (Bennett 4773 p.p.) [Brown's annotation: *Eucalyptus costata*]
- Eucalyptus baxteri* R.Br. ex Benth. (Bennett 4744) – there are 2 sheets with this Bennett number. The other relates to *E. viminalis* at this locality, Kangaroo Island and Anchorage VIII. The identification of this sheet as *E. baxteri* is probably incorrect.
- Eucalyptus dumosa* A.Cunn. ex J.Oxley var. *conglobata* R.Br. ex Benth. (Bennett 4749 p.p.) Probably *E. conglobata* (Benth.)Maiden. [Brown's annotation: *Eucalyptus conglobata*]
- Eucalyptus incrassata* Labill. (Bennett 4763)
- Eucalyptus rugosa* R.Br. ex Blakely (Bennett 4764 p.p.) [Brown's annotation: *Eucalyptus rugosa*]
- Eucalyptus viminalis* Sm. (Bennett 4744 p.p.) ssp. *cygnetensis* Boomsma.
- Euphrasia collina* R.Br. ssp. *tetragona* (R.Br.)W.R.Barker (Bennett 2720 p.p.) [Brown's annotation: *Euphrasia* cfr *collina*]
- Gahnia deusta* (R.Br.)Benth. (Bennett 6051). Type gathering of *Cladium deustum* R.Br. [Brown's annotation: *Schoenus collinus* ss]
- Gonocarpus meizianus* (Schindl.)Orchard (Bennett 4554) [Brown's annotation: *Schoenus collinus* ss]
- Goodenia varia* R.Br. (Bennett 2518 p.p.). Part of type gathering.
- Goodia pubescens* Sims (Bennett 4241 p.p.) = *Goodia medicaginea* F.Muell.
- Helichrysum apiculatum* DC. = *Chrysocephalum apiculatum* (Labill.)Steetz (Bennett 2180 p.p.)
- Helichrysum leucopsidium* DC. (Bennett 2193) [Brown's annotation: *Argyroceme revoluta*]
- Hibbertia densiflora* F.Muell. (Bennett 4892) = *H. cinerea* (R.Br. ex DC.)Toelken. Type gathering of *Pleurandra cinerea* R.Br. ex DC. (Toelken 1998).
- Hibiscus huegelii* Endl. (Bennett 5133) = *Alyogyne huegelii* (Endl.)Fryxell [Brown's annotation: *Hibiscus althaeoides*]
- Ixodia achilleoides* R.Br. (Bennett 2147 p.p.) [Brown's annotation: Gen Nove prope ..]
- Ixiolaena supina* F.Muell. (Bennett 2159 p.p.) [Brown's annotation: *Chrysocomoides penicellatum*]
- Lasiopetalum baueri* Steetz. (Bennett 5156). [Brown's annotation: *Lasiopetalum cinereum*]
- Lasiopetalum discolor* Hook. (Bennett 5165 p.p.) [Brown's annotation: *Lasiopetalum bracteatum*]
- Lasiopetalum schulzenii* Benth. (Bennett 5164). [Brown's annotation: *Lasiopetalum rugosum*]
- Leptomeria aphylla* R.Br. (Bennett 3199). Type gathering of this species. [Brown's annotation: *Oxycarpus junceus*]
- Lobelia gibbosa* Labill. (Bennett 2626 p.p.)
- Logania crassifolia* R.Br. (Bennett 2902 p.p.). Part of type gathering.
- Myoporum viscosum* R.Br. (Bennett 2796). Type of *M. viscosum* R.Br.
- Myoporum* sp.indet. (Bennett s.n.). [Brown's annotation: *Myoporum viscidum* suggests that this is also *Myoporum viscosum*].
- Olearia axillaris* (DC.)F.Muell. ex Benth. (Bennett 2242) [Brown's annotation: *Aster exsulens*]
- Olearia lanuginosa* (J.H.Willis)N.A.Wakef. (Bennett 2244) [Brown's annotation: *Asteroides fasciculata*]
- Pimelea flava* R.Br. (Bennett 3181 p.p.) Part of type gathering.
- Pimelea glauca* R.Br. (Bennett 3163 p.p.). Part of type gathering.
- Pimelea serpyllifolia* R.Br. (Bennett 3178 p.p.)
- Pomaderris orbicorda* Fenzl. (Bennett 5375 p.p.) [Brown's annotation: *Ceanothoides cuneatus*]
- Pomaderris racemosa* Hook. (Bennett 5369 p.p.) [Brown's annotation: *Ceanothus tomentosa*]
- Prostanthera serpyllifolia* (R.Br.)Briq. ssp. *microphylla* (R.Br.)B.J.Conn (Bennett 2360). Type of *Cryphia serpyllifolia* R.Br.
- Pultenaea acerosa* R.Br. ex Benth. (Bennett 5041). Syntype: see de Kok & West (2003).
- Pultenaea rigida* R.Br. ex Benth. (Bennett 5034). Type collection of species = *P. acerosa* R.Br. ex Benth.: see de Kok & West (2003).
- Santalum acuminatum* (R.Br.)A.DC. (Bennett 3214 p.p.) ?Part of type gathering of *Fusanus acuminatus* R.Br.
- Scleranthus pungens* R.Br. (Bennett 3088). Type collection of species
- Schoenus deformis* (R.Br.)Poir. ex Roem. & Schult. (Bennett 6009). Type gathering of *Chaetospora deformis* R.Br.
- Senecio odoratus* Hornem (Bennett 2304 p.p.) [Brown's annotation: *Senecio polymorphus*]
- Templetonia retusa* (Vent.)R.Br. (Bennett 5076 p.p.) [Brown's annotation: *Rafnia retusa*]

Peter Good's seed list for Memory Cove
(Edwards 1981, p. 163)

- Lasiopetalum angustifolium* [probably *Lasiopetalum baueri* Steetz]
Hibiscus [*Alyogyne huegelii* (Endl.)Fryxell, Brown specimen is Bennett 5133]
 Legum: legum compress fol retus [*Templetonia retusa* (Vent.)R.Br. *T. retusa* was successfully raised at Kew Gardens and its introduction attributed to Peter Good]
Lasiopetalum rugosum [Brown's manuscript name for *Lasiopetalum schulzenii* (F.Muell.)Benth.]
Eucalyptus turbinata [Eucalyptus with turbinate fruit]
Curatelloides canescens [*Curatella* is a genus of Dilleniaceae, and so this is possibly an *Hibbertia* spp.]
Cistoides urticifolia [Cistoides of Brown usually denoted a species of *Hibbertia*]
Dioica flor. masc. spec. [dioecious flowers, male specimen: *Adriana*, *Beyeria* and *Dodonaea* are all possibilities in the list above]
Eucalyptus rudis peduncul compress fruit multiangul [Eucalyptus with multiangular fruit]
Bursaria speciosa [*Bursaria spinosa* – Bennett 5457 p.p.]
Mimosa spinosissima [Brown's ms name for *A. paradoxa* DC. (Bennett 4313 p.p.)]
Eucalyptus purpurascens [Brown's ms name for *Eucalyptus lansdowneana* F.Muell. & J.E.Brown (Bennett 4735)]
Cassytha nov Holland [any one of three species recorded for this area. There is apparently no extant Brown specimen]
 Legum fol ternat legum plan compress polysperm [ternate leaves, probably *Goodia medicaginea* F.Muell. (Bennett 4241)]
Scutellarioides odorata [*Prostanthera serpyllifolia* (R.Br.)Briq. ssp. *microphylla* (R.Br.)B.J.Conn. Extant Brown collection is Bennett 2359]
Myoporum viscidum [*Myoporum viscosum* R.Br. – successfully grown at Kew Gardens and its introduction in 1803 credited to Peter Good]
Dodonaea alata [*Dodonaea* with winged fruits would seem to be more likely to be *D. viscosa*, *D. lobulata* or *D. stenozuga*. Fruits of *D. humilis* (*D. aptera* of Brown) are sticky and unwinged, *D. hexandra* not noticeably winged]
Lasiopetalum bracteatum few seeds [Brown's manuscript name for *Lasiopetalum discolor*]
Centauroides scariosa [presumably a composite resembling *Centaurea* in appearance]
*Ceanothoides apetal*a [Brown's ms name for *Pomaderris* spp.]
Gnaphaloides viscida [perhaps *Cassinia uncata* Cunn. ex DC. Although not recorded as being collected by Brown, it does occur in the area and is a sticky species found in coastal areas]
Gnaphalium aureum probably no seed [*Chrysoccephalum apiculatum* (Labill.)Steetz (Bennett 2180)]
Dodonaea an var *viscosa* [one of the forms of *Dodonaea viscosa*]
Eucalyptus nov sp
Melaleuca nov sp
Melaleuca decussata (*Melaleuca decussata* R.Br.
Scaevola viscida [possibly *Scaevola crassifolia* Labill. (Bennett 2557 from Bay X, Port Lincoln) which has young leaves which are viscid]

Peter Good's document on soil types

Some species included in a list documenting soil types (Edwards 1981, p. 153) did not occur in the list above; these have been added below, since some of them are not mentioned elsewhere.

- Myoporum procumbens*
Myoporum caecum [= *Myoporum insulare*]
Crotonoides urticifolia [*Crotonoides* usually meant a *Beyeria* species, but the epithet *urticifolia* was used by Brown in combination with *Cistoides*, which usually denoted a *Hibbertia* species. Both genera were collected at this locality]
Clematis [possibly *Clematis microphylla* DC. (Bennett 4853). The herbarium specimen merely is attributed to South Coast without a specific locality]
Mesembryanthemum [presumably *Mesembryanthemum clavellatum* Haw. = *Disphyma crassifolium* (L.)L. Bolus. According to the protologue this species was raised by Haworth from seed supplied by Kew in 1803. See list of introductions to Kew Gardens attributed to Peter Good, see Table 3]
Mimosa triquetra [*Acacia* sp., possibly *Acacia triquetra* Benth., which does occur in this area. Seed was also collected at Bay X]
Mimosa viscida [viscid *Acacia* sp., also listed for Bay X]
Campanula afr. simplicicaulis [this is the name Brown applied to *Wahlenbergia bicolor* Lothian (Bennett 2617 p.p.) = *W. luteola* P.J.Smith]

Bay X, Port Lincoln (25 February – 6 March 1802)

25th February. Anchored in the bay about 4 p.m. Brown and Good went on shore for an hour or so. They collected a possum which they thought to be new, but could not find any fresh water, their prime goal at this stage.

26th February. A party landed at 5 a.m. and walked to the top of the nearest hill [Stamford Hill] where they had a good view of the bay and all its possible anchorages, as well as a lake [Sleaford Mere] which they supposed to be fresh water. Apart from Bauer's collection of a new species of *Acacia*, no new plants were observed and they were back on board by 10 a.m.

The *Investigator* was moved further up the bay towards the lake and anchored again at 1 p.m. Flinders, Brown and Good investigated the lake, which was found to be brackish, but fresh water was later located near the beach. Good records collecting several new plants during this excursion, but Brown only records a new snake being killed.

27th February. Tents were erected on shore. The scientific party set off at 8 a.m. to walk to the top of North Side Hill. Both Brown and Good commented on the recent burning of the area and the presence of fires, still burning, in the distance. They returned by walking straight down the hill to the sea and then walking parallel to the shore. Although they came across a well trodden path, they saw sign of the local aborigines or any of their huts.

Brown records collecting a few new plants, amongst them a *Banksia*. William Westall's painting¹⁵ of Spencer's Gulf, *Banksia* was almost certainly made here since *Banksia marginata* does not occur at the top of the gulf.

¹⁵ See Thomas (2002, p. 113) or view it on-line on the National Library of Australia (2004) webpage.

28th February. Brown remained on board ship describing and preparing his plant collections. Good went ashore at Brown's behest to walk down the opposite side of the bay, but found little of interest except a native path, similar to that seen the day before.

1st March. Landed at 8 a.m. and the scientific party walked to the lake [Sleaford Mere] and then around it and across to Sleaford Bay, where they found the mainsail of the lost cutter. Good comments on the "dreadful surf" all around. They found little of interest, Brown recording he had found only one new species for his collection.

2nd March. Brown and Good remained on board dealing with the plants collected the day before.

3rd March. Brown and Good went ashore and walked along the bay to the bottom of North Side Hill. Brown records finding no new plants but an *Oxalis* in flower and a new Rutaceous plant [*Microcybe pauciflora* Turcz.]. Fowler was sent off to Memory Cove in the cutter for 2–3 days to look for further wreckage and the bodies of the lost crew.

4th March. Brown again remains on board. Good went ashore in the afternoon and found flowering specimens of the *Melaleuca* found at Memory Cove and of a *Convolvulus*. He records seeing four emus at a distance. He also notes that two aborigines were seen near the tents and records the finding of a native hut containing 17 spears and other implements.

Following the observation of the eclipse of the sun experienced this day, the tents were dismantled and preparations made for moving off early the next day.

5th March. Having left early the ship anchored in Spalding Cove about 10 a.m., according to Good. Brown records departure in the forenoon and anchorage in the evening. Good's account is supported by that of Flinders. Fowler returns from Memory Cove having had no success in locating the wreck of the cutter or any of the crew.

Good and Brown went ashore here on the South point. Vallance et al. (2001) suggest he means Cape Colbert.

6th March. Departure in the morning.

Brown's collections from Bay X (Port Lincoln) still extant

- Acacia calamifolia* Sweet ex Lindl. (Bennett 4301) [Brown's annotation: *Mimosa intermedia*]
- Acacia dodonaeifolia* (Pers.) Balb. (Bennett 4341 p.p.) [Brown's annotation: *Mimosa* cf. *Fucata*]
- Acacia myrtifolia* (Sm.) Willd. (Bennett 4347 p.p.)
- Acacia pycnantha* Benth. var. *angustifolia* (Bennett 4340) = *A. gillii* Maiden & Blakely. Type of *A. pycnantha* var. *angustifolia* Benth. Listed, in error, in *Flora of Australia* 11A: 278, as having been collected at Memory Cove.
- Acacia retinodes* Schltdl. (Bennett 4350)
- Acacia salicina* Lindl. (Bennett 4338 p.p.) Identification possibly not correct as this species is not recorded

- for the area (Whibley & Symon 1992). [Brown's annotation: *Mimosa pedunculata*]
- Acacia spinescens* Benth. (Bennett 4316 p.p.) [Brown's annotation: *Mimosa* ?*aphylla*]
- Acaena ovina* A.Cunn. (Bennett 4391 p.p.). Possibly *A. echinata* Nees var. *echinata*. [Brown's annotation: *Acaena interrupta*.]
- Adenanthos terminalis* R.Br. (Bennett 3260). Type of the species. [Brown's annotation: *Proteoides appressa*]. Bauer's original illustration of this specimen in the Naturhistorisches Museum of Vienna was used as the basis for the illustration in Endlicher's (1837–41) *Iconographia generum plantarum* in 1838 (see Fig. 18).
- Adriana klotzchii* (F.Muell.) Müll.Arg. = *A. quadripartita* (Labill.) Müll.Arg. (Bennett 3585 p.p.)
- Baeckea behrii* F.Muell. (Bennett 4588 p.p.) [Brown's annotation: *Baeckea mucronata*]
- Banksia marginata* Cav. (Bennett 3394) Type of *Banksia patula* R.Br.
- Beyeria opaca* F.Muell. (Bennett 3588). Probably *B. lechenaultii* (DC.) Baill. since Kangaroo Island material is wrongly determined as this. [Brown's annotation: *Crotonoides* sp. 5]
- Billardiera cymosa* F.Muell. (Bennett 5465, 5466) [Brown's annotation: *Billardiera digyna*/B. *sericea*]
- Bursaria spinosa* Cav. (Bennett 5457 p.p.)
- Casuarina baxteriana* Miq. (Bennett 3136 p.p.) a Western Australian, not South Australian species. Presumably one of the three shrubby species occurring in the area.
- Casuarina humilis* Otto & A.Dietr. = ?*Allocasuarina helmsii* (Ewart & M.Gordon) L.A.S. Johnson (Bennett 3128)
- Centella asiatica* L. = *Centella cordifolia* (Hook.f.) Nannf. (Bennett 4494) [Brown's annotation: *Hydrocotyle grandis*]
- Convolvulus remotus* R.Br. (Bennett 2766 p.p.) Type collection of species. [Brown's annotation: *Convolvulus remotus* R.Br.]
- Correa* sp. (Bennett 5309) [Brown's annotation: *Correa varia* var. *furfuracea*]
- Correa* sp. (Bennett 5310) [Brown's annotation: *Correa varia* var. *dentibus* and var. *glabrel*]
- Correa* sp. (Bennett 5320 p.p.) [Brown's annotation: *Correa glabra*]
- Dodonaea hexandra* F.Muell. (Bennett 5426) [Brown's annotation: *Dodonaea sericifolia*]
- Dodonaea viscosa* Jacq. (Bennett 5435 p.p.)
- Eucalyptus rugosa* R.Br. ex Blakely (Bennett 4764 p.p.)
- Eucalyptus angulosa* Schauer (Bennett 4773 p.p.)
- Eucalyptus viminalis* Sm. ssp. *cygnetensis* Boomsma (Bennett 4742)
- Eucalyptus grandis* W.Hill (Bennett 4799 p.p.) Identification erroneous – this is an eastern states species only; possibly *E. leucoxylon* F.Muell.
- Eucalyptus oleosa* F.Muell. (Bennett 4770 p.p.) [Brown's annotation: *Eucalyptus longisate*]
- Eucalyptus dumosa* A.Cunn. ex Oxley var. *conglobata* R.Br. ex Benth. (Bennett 4749 p.p.) [Brown's annotation: *Eucalyptus conglobata*]
- Eucalyptus anceps* (R.Br. ex Maiden) Blakely (Bennett 4748 p.p.) – det needs checking
- Exocarpos cupressiformis* Labill. (Bennett 3207 p.p.)
- Gahnia lanigera* (R.Br.) Benth. (Bennett 6052). Type of *Cladium lanigerum* R.Br. [Brown's annotation: *Schoenus lanigerum*]
- Geijera parviflora* Lindl. (Bennett 5336) (not otherwise recorded for Eyre Peninsula (W.R. Barker et al. 2005), but *G. linearifolia* (DC.) J.M. Black is) [Brown's annotation: *Fagaria linearis*]
- Grevillea aspera* R.Br. (Bennett 3341) Type collection of

- species.
- Grevillea ilicifolia* (R.Br.)R.Br. (Bennett 3314) Type of *Anadenia ilicifolia* R.Br.
- Grevillea pauciflora* R.Br. (Bennett 3340 p.p.) Part of type gathering. Bauer's completed painting of this species is in the Natural History Museum, London. It has been reproduced in Olde & Marriott (1994, 1, t.14), in Mabberley & Moore (1999, p. 150), and on the Natural History Museum, London (2006) website.
- Hakea cycloptera* R.Br. (Bennett 3373)
- Hakea rugosa* R.Br. (Bennett 3382)
- Hakea vittata* R.Br. (Bennett 3372) [Brown's annotation: Conchium S]
- Helichrysum apiculatum* DC. = *Chryscephalum apiculatum* (Labill.)Steetz (Bennett 2181) [Brown's annotation: Gnaphalium]
- Hibbertia stricta* (R.Br. ex DC.)F.Muell. (Bennett 4880 p.p.) – identification still to be clarified. [Brown's annotation: Curatelloides/Pleurandra taxifolia]
- Humea cassiniacea* F. Muell. = *Haeckeria cassiniiformis* F. Muell. (Bennett 2155).
- Imperata cylindrica* Beauv. (Bennett 6135 p.p.)
- Ixodia achilleoides* R.Br. (Bennett 2147 p.p.) [Brown's annotation: Gen Nov prope..]
- Juncus kraussii* Hochst. ssp. *australiensis* (Buchenau)Snogerup (Bennett s.n. or 5791 p.p.) – subspecies not recognised in South Australian census (W.R. Barker et al. 2005)
- Lawrenzia spicata* Hook. (Bennett 5110). [Brown's annotation: Sida.]
- Lasiopetalum behrii* F. Muell. (Bennett 5159). [Brown's annotation: Lasiopetalum strictum]
- Lasiopetalum discolor* Hook. (Bennett 5165 p.p.) [Brown's annotation: Lasiopetalum bracteatum]
- Lepidosperma viscidum* R.Br. (Bennett 6035). Type collection of species. [Brown's annotation: Schoenus viscidum]
- Logania crassifolia* R.Br. (Bennett 2902 p.p.). Part of type gathering.
- Linum marginale* A.Cunn. (Bennett 5214 p.p.) [Brown's annotation: Linum Novae Hollandiae]
- Lobelia alata* Labill. (Bennett 2622 p.p.)
- Lobelia gibbosa* Labill. (Bennett 2626 p.p.)
- Melaleuca acuminata* F. Muell. (Bennett 4688 p.p.)
- Melaleuca decussata* R.Br. (Bennett 4682). Type gathering of species.
- Melaleuca wilsonii* F. Muell. (Bennett 4689).
- Monotaxis* sp. indet. (Bennett 5498). There are no coastal representatives of this genus in South Australia and so the identification needs to be revisited.
- Myoporum humile* R.Br. = *M. parvifolium*
- Myoporum humile* R.Br. = *M. parvifolium* R.Br. (Bennett 2791 p.p.) Part of type gathering of *M. humile* R.Br.
- Myoporum parvifolium* R.Br. (Bennett 2790) Type collection of species.
- Microcybe pauciflora* Turcz. (Bennett 5477) [Brown's annotation: Genus Rutac..]
- Olearia axillaris* F. Muell. (Bennett 2247 p.p.) [Brown's annotation: Aster gnaphalodes]
- Olearia ciliata* (Benth.)F. Muell. ex Benth. (Bennett 2225 p.p.) [Brown's annotation: Aster peduncularis/Asteroides rigida]
- Olearia rudis* (Benth.)F. Muell. ex Benth. (Bennett 2015 p.p.) [Brown's annotation: Asteroides scabrata/Aster asperimus]
- Pelargonium littorale* Hugel (Bennett s.n. or 5225)
- Picris hieracioides* L. (Bennett 2216). *P. hieracioides* does not occur in S.A. – this is probably *Picris angustifolia* DC. which does occur in the area [Brown's annotation: *Picris macrospermis*]
- Pimelea glauca* R.Br. (Bennett 3163 p.p.). Part of type gathering.
- Pimelea* sp. (Bennett 3191 p.p.). Collected here or at Mt Brown.
- Pomaderris obcordata* Fenzl. (Bennett 5375 p.p.) [Brown's annotation: Ceanothoides obcordata]
- Prasophyllum nigricans* R.Br. (Bennett 5551). Type collection of species. Now known as *Genoplesium nigricans* (R.Br.)D.Jones & M.Clements. "The type consists of a study set only, remainder lost in transit" is written on the sheet (Clements 1989).
- Prostanthera serpyllifolia* (R.Br.)Briq. ssp. *microphylla* (R.Br.)Conn (Bennett 2359). Type of *Cryphia microphylla* R.Br.
- Pultenaea elliptica* Sm. (Bennett 5038) not in SA – identification needed. According to de Kok & West (2002) this is *P. tuberculata* Pers. but that species does not occur in South Australia [Brown's annotation: *Pultenaea cinerea*].
- Pultenaea tenuifolia* R.Br. ex Sims (Bennett 5040 p.p.)
- Pultenaea vestita* R.Br. (Bennett 5039). Type collection of species.
- Samolus repens* (Forst. & Forst.f.)Pers. (Bennett 2817 p.p.) [Brown's annotation: *Samolus littoralis*]
- Senecio hispidulus* A.Rich. var. *dissectus* (Benth.)Belcher (Bennett 2281) [Brown's annotation: *Senecio plebeius*]
- Scaevola aemula* R.Br. (Bennett 2559). Type collection of species.
- Scaevola crassifolia* Labill. (Bennett 2557).
- Scaevola linearis* R.Br. (Bennett 2566). Type collection of species.
- Selliera radicans* Cav. (Bennett 2538 p.p.) [Brown's annotation: *Goodenia littoralis/repens*]
- Solanum simile* F. Muell. [see Symon 1981, p. 89] (Bennett 2665 p.p.) [Brown's annotation: *Solanum laciniatum* var. *integrifolium*]
- Sporobolus virginicus* Kunth (Bennett 6209 p.p.) [Brown's annotation: *Agrostis virginicus*]
- Schoenus nitens* (R.Br.)Poir. ex Roem. & Schult. (Bennett 6014 p.p.). Type of *Chaetospora nitens* R.Br.
- Scirpus nodosus* Rottb. = *Isolepis nodosa* (Rottb.)R.Br. (Bennett 5973 p.p.)
- Tricoryne tenella* R.Br. (Bennett 5696). Type gathering of species. [Brown's annotation: *Anthericoides tenella*]
- Themeda australis* (R.Br.)Stapf = *Themeda triandra* Forssk. (Bennett 6194 p.p.). ?Part of type gathering of *Anthistiria australis* R.Br.
- Vittadinia australis* A. Rich. (Bennett 2025, 2028) [probably *V. australasica* (Turcz.)N.T.Burb. var. *australasica* – see Burbidge (1982)] [Brown's annotation: *Erigeron glandulosum*]
- Wahlenbergia bicolor* Lothian (Bennett 2617 p.p.) = *W. luteola* P.J.Smith [Brown's annotation: *Campanula simplicaulis*]
- Zygophyllum billardieri* DC. (Bennett 5221 p.p.) [Brown's annotation: *Zygophylloides octandra*]

Peter Good's seed collections from Bay X

- Conchium fol teretifolius sp. A caps gibbous (*Hakea vittata* R.Br. or *Hakea cycloptera* R.Br.)
- sp. B caps compress (*Hakea vittata* R.Br. or *Hakea cycloptera* R.Br.)
- sp. C caps rugos compress mucronat apic reflex (*Hakea rugosa* R.Br.)
- Casuarina equisetifolia [Casuarina or Allocasuarina species, probably *A. verticillata* (Lam.) L.A.S.Johnson]
- Melaleuca 4 gone affin maxim M. armillaria [one of the 10 species of *Melaleuca* in the area]
- Epilobium cfr E. glabellum Forst. [*Epilobium*

- billardieranum* Ser.]
Scaevola cfr *S. varia* [one of the 3 listed *Scaevola* species collected by Brown]
Lotus nov. Hollandiae [*Lotus australis* or *Lotus cruentus* – repeated below – Peter Good was credited by Aiton with the introduction of this species to Kew Gardens in 1803]
Linum nov. Hollandiae [*Linum marginale* A.Cunn]
Asteroides nov. sp. [?*Olearia* sp.]
Sida paradoxa [Lawrencia sp.]
Melaleuca maxim aff. *M. albiflora* [one of the 10 species of *Melaleuca* in the area]
Mimosa viscida [viscid *Acacia* sp., also listed for Memory Cove]
Nov. Gen. composit. [either *Ixodia achilleoides* R.Br. (Bennett 2147 p.p.), since Brown's labels comment on this new genus which was collected from Anchorages 8–10 or *Humea* (Bennett 2155), also labelled as a new genus. However *Ixodia achilleoides* was successfully grown in Kew Gardens and attributed to Peter Good]
Mimosa triquetra [*Acacia* sp., possibly *Acacia triquetra* Benth., which does occur in this area. Seed was also collected at Memory Cove]
Pultenaea riparia [one of the *Pultenaea* species above, probably *P. vestita* R.Br. since this was successfully raised at Kew Gardens and attributed to Peter Good]
Asteroides microphylla [possibly *Olearia lepidophylla* (Pers.) Benth. or *O. lanuginosa* (J.H. Willis) N. A. Wakef.]
Campanula cfr *simplicicaulis* Sol. [*Wahlenbergia bicolor* Lothian]
Ancistrum cfr *Ancist sanguisorba* [?*Acaena echinata* Nees]
Melaleuca decussata [*Melaleuca decussata* R.Br. (Bennett 4682)] – successfully grown in Kew Gardens.
Scaevola hirta caule erecto ramoso foliis limonibus integris dentatum [*Scaevola* spp.]
Goodenia varia aff. *ovalis* [*Goodenia varia* R.Br. or *Selliera* sp.]
Baeckia [*Baeckea behrii* F. Muell.]
Goodenia uniflora – acaulis scapo subuniflora [*Selliera radicans* Cav. (Bennett 2538 p.p.)]
Billardiera sericea aff. *B. scandens* [*Billardiera cymosa* F. Muell.]
Linum Nova Hollandiae [repeated, see above]
Lobelia caule subsimplex erecto floribus pallida coerulescens [?*Lobelia gibbosa* Labill.]
Gen. [Te]hymaloid dioic. and caps. dicona [?*Pimelea* sp.]
Convolvulus [*Convolvulus remotus* R.Br.]
Fagara enodia cfr [*Geijera parviflora* Lindl.]
Arenaria marina [*Spergularia marina* – treated as introduced]
Oryza marginata [no suggestions]
Anthericoides juncea [*Tricoryne tenella* R.Br. was collected from here, but the manuscript name *Anthericoides juncea* more usually referred to *Tricoryne elatior* R.Br., which also occurs in this area, but was apparently not collected by Brown]
Lotus amarus [*Lotus australis* or *Lotus cruentus*]
Mimosa [*Acacia* sp.]

Anchorage XI, Kirkby Island (6–7 March 1802)

6th March. Anchorage under the lee of this island at 5 p.m.

7th March. Brown and Good went ashore after breakfast. Brown records covering the greater part of the island, before returning on board at midday. He made comments

about the granitic nature of the island and listed several bird species, amongst them a Pacific gull, pelican and Fairy penguin. He also recorded what he thought might be a new species of *Salsola* (generic term for Chenopodiaceae) and what might be a distinct species of *Polygonum*.

Good records departure from the island, to proceed up the gulf, at noon. He also notes that, in accordance with Navy custom, the belongings of the lost crew were sold at auction and two promotions of crew made to cover the loss of the officers.

Brown's collections from Anchorage XI still extant

Maireana brevifolia (R.Br.) Paul G. Wilson (Bennett 3084?).
Type of *Kochia brevifolia* R.Br.

Inlet XII, Mt Brown (9–13 March 1802)

9th March. Anchored off Red Cliff Point at the top of Spencer Gulf.

10th March. Before 6 a.m. a party of seven, including Robert Brown (naturalist), Peter Good (gardener), Ferdinand Bauer (botanical artist), William Westall (landscape artist), John Allen (miner) and Brown's and Westall's servants (Porter and White) set off for the highest mountain which they thought to be no more than 5 miles from the beach.

The route across the plain. From the boat, the party waded for half a mile through water nearly a foot deep and mostly covered with sea-grasses (*Zostera*). The first mile of country crossed was flat and sandy and covered with almost the same plants as those observed at their previous stop at Fowlers Bay. The next mile was also over flat ground but with salt rivulets and vegetation associated with salt marshes.

At the end of the swampy ground they entered a sandy area, also about a mile broad, with scattered small shrubs with wind-blown sand accumulated on their land side. This was succeeded by a wood, "the trees of which were of no considerable size and chiefly a species of *Eucalyptus*". There were native huts at the edge of this mallee scrub, which was of "considerable breadth". After this they again entered a plain, this time with tufted grass and occasional shrubs on a stony surface. The stones were similar to those on the mountain.

There was a gradual ascent in the area where they encountered the beds of several rivulets with banks a few feet in height.

The ascent. At 2 p.m. they reached the base of the mountain and "climbed the hill a little east of the mountain whose top we intended to ascend". Brown records this first hill as steep. Both of the servants were so overcome with fatigue that they were ordered to go back and remain at the spring (Woolundunga) at the base of the mountains. From the summit of this first hill the party had to continually ascend and descend similar hills until they made it to the summit of Mt Brown just before sunset. Brown recorded the hills as being rounded and

separated from each other by narrow ravines, with their sides mostly covered with a spiny grass [spinifex or *Triodia*] and *Xanthorrhoea*, and with herbs and shrubs in the hollows together with trees of “tolerable size” of *Casuarina equisetifolia* [*Allocasuarina verticillata*] and a species of *Eucalyptus*.

The view from the summit. Brown’s only comment on the view of the inland was that it was quite flat, with no water or mountain ranges in sight, and they were unable to take bearings because the sun had set. Peter Good, on the other hand, was much more informative.

It was very near sunset before we reached the summit when we had a most extensive view probably the most extensive ever had in New Holland, being elevated full 3000 feet above the level of the Sea and it may be said 100 miles in the heart of the country – on the south was the range of mountains rising behind each other with ravines & deep gullies from these mountains to West was a great tract of low land, the River or Arm of the Sea & and a hilly country beyond, from which to North was a level plain as far as the eye could reach with the continuation of the River gradually diminishing till it was lost in the low plains to the North from which to the East & Round to the South was a vast plain terminated by a range of hills parallel to what we were on running from North to South

A disturbed night. After resting for half an hour they descended about a third of the way from the top to a gully [now known as Peter Good Gully] where they spent an uncomfortable night, without water.

Having gratified ourselves with viewing this extensive and boundless desert we begun to descend with all expedition, but were soon overtaken with darkness & some of the party being overcome with fatigue on arrival at the bottom of a deep Gullie we though fit to spend the night but it was spent uncomfortably – little firewood could be got the night air was very cool in this elevated situation – the ground was full of stones and so uneven that we could not lay – add to which some had no water having trusted to finding water among the mountains & we had not been so fortunate to find any – the morning was anxiously expected few of the party having had any refreshing sleep.

At day break the party descended the mountain and reached the spring about 7 a.m. where the servants were found “very comfortable, with plenty of fine water and a good fire”. They had also had a disturbed night since they had heard human voices nearby and what they assumed to be dogs howling. The party quenched their thirst and ate some “musty bisquit & Salt Beef”. They collected about the spring since Good records finding a Tobacco and other new plants.

Return to the ship. Just before 8 a.m. they set off again for the ship. They finally reached the shore about 5 p.m. all suffering considerably from fatigue and a lack of water as a result of the day being so hot. On going on board they found that Flinders had not yet returned from taking the cutter further up the gulf. He returned around 11 p.m., his party having rowed some 15 to 20 miles up the gulf to West Augusta, just below the present site of the Aridlands Botanic Gardens.

11th March. All remained aboard except Mr Fowler who went off in the cutter to take sounding in the western side

of the bay. Brown and Good spent the day dealing with their collections from Mt Brown and Bauer is known to have done drawings of three of the plants which had been collected on the previous days, *Cynanchum floribundum*, *Senna artemisioides* and *Eremophila scoparia*.

Brown’s collections from Inlet XII still extant

Acacia myrtifolia (Sm.) Willd. (Bennett 4347 p.p.)
– possibly a misidentification or wrong locality. The species is not considered to occur here (see above)

Acacia papyrocarpa Benth. (Bennett 4343)

Acacia salicina Lindl. (Bennett 4345)

Acacia longifolia Willd. (Bennett 4271, as 4721)

Alectryon oleifolius (Desf.) S.Reyn. ssp. *canescens* S.Reyn. (Bennett 5475) [Brown’s annotation: Cupanioides]

Amyema pendula (Sieber ex Spreng.) Tiegh. (Bennett 2952)
– possibly *A. miquellii* (Lehm. ex Miq.) Tiegh. since *A. pendula* is not recorded for this area. The specimen was growing on a Eucalypt species.

Boerhavia coccinea Mill. (Bennett 3009)

Bassia divaricata (R.Br.) F.Muell. = *Sclerolaena divaricata* (R.Br.) Smith in Rees (Bennett 3078)

Bassia paradoxa (R.Br.) F.Muell. = *Dissocarpus paradoxus* (R.Br.) Ulbr. (Bennett 3077)

Brachyscome marginata Benth. = *B. dentata* Gaudich. (Bennett 2077)

Callitris gracilis R.T.Baker (Bennett 3108) [Brown’s annotation: Callitris glauca Nob/Genus conifer]

Calostemma purpureum R.Br. (Bennett 5641). Type of

Calostemma purpureum R.Br. [Brown’s annotation: *Pancratium purpureum*]

Carex pseudo-cyperus L. = *C. fascicularis* Sol. ex Boott (Bennett 6077)

Calocephalus citreus Less. (Bennett 2142 p.p.) [Brown’s annotation: *Cartodioides acida*]

Cassia eremophila A.Cunn. (Bennett 4335) = *Senna artemisioides* (DC.) Randell ssp. *coriacea* (Benth.) Randell [Brown’s annotation: *Mimosa*]

Cassia phyllodinea R.Br. (Bennett 4253) = *Senna artemisioides* (DC.) Randell ssp. *petiolaris* Randell [Brown’s annotation: *Cassia simplicifolia*]. Illustrated by Ferdinand Bauer at this locality – the only image available of the finished painting in the Natural History Museum, London, is in Mabberley & Moore (1999, p.108) or there is a low resolution reproduction in the State Herbarium of South Australia.

Cassia sturti var. *coriacea* Benth. (Bennett 4334) = *Senna artemisioides* (DC.) Randell ssp. *coriacea* (Benth.) Randell [Brown’s annotation: *Mimosa pinnata*]

Cassinia arcuata R.Br. (Bennett 2152) Type gathering of species. [Brown’s annotation: *Gnaphalium*]

Cassinia laevis R.Br. (Bennett 2151) Type gathering of species.

Cheilanthes lasiophylla Pichi-Serm. (Bennett 4 b)

Chrysocephalum apiculatum (Labill.) Steetz (Bennett 2183) [Brown’s annotation: *Armochate stricta*]

Convolvulus ?remotus R.Br. (Bennett 2766 p.p.). Possibly *C. microsepalus* R.W.Johnson.

Cullen australasicum (Schtdl.) J.W.Grimes (Bennett 4135) [Brown’s annotation: *Trifolium colleneum*]

Cynanchum floribundum R.Br. (Bennett 2874). Type gathering of species. Illustrated by Ferdinand Bauer at this locality – the finished painting in the Natural History Museum, London, is shown in full colour in Thomas (2002, p. 89), in black and white in Mabberley & Moore (1999, p.108), on the Natural History Museum, London (2006) website, and as a low resolution reproduction in the State Herbarium of South Australia.

Cyperus vaginatus R.Br. (Bennett 5922 p.p.). Part of type gathering

Dissocarpus paradoxus (R.Br.)F.Muell. ex Ulbr. (Bennett 3077) Type of *Sclerolaena paradoxa* R.Br. [Brown's annotation: *Salsoloides captata*]

Dodonaea baueri Endl. (Bennett 5429 p.p.) [Brown's annotation: *Dodonaea repasa*]

Dodonaea stenozygia F.Muell. (Bennett 5443 p.p.)

Dodonaea viscosa Jacq. ssp. *angustissima* (DC.)J.G.West (Bennett 5434 p.p.)

Dodonaea lobulata F.Muell. (Bennett 5444) [Brown's annotation: *Dodonaea dentata*]

Enneapogon nigricans (R.Br.)Beauv. (Bennett 6249)

Eremophila alternifolia R.Br. (Bennett 2340) Type gathering of species.

Eremophila glabra (R.Br.)Ostenf. (Bennett 2338 p.p.) Part of type gathering. See Figure 17.

Eremophila longifolia (R.Br.)F.Muell. (Bennett 2339 p.p.) Part of type gathering of *Stenochilus longifolius* R.Br.

Eremophila oppositifolia R.Br. (Bennett 2341) Type gathering of species.

Eremophila scoparia (R.Br.)F.Muell. (Bennett 2337) Type gathering of *Pholidia scoparia* R.Br. Illustrated by Ferdinand Bauer at this locality – the finished painting in the Natural History Museum, London, is shown in full colour in Thomas (2002, p. 59), in black and white in Mabberley & Moore (1999, p. 141), on the Natural History Museum, London (2006) website, and as a low resolution reproduction in the State Herbarium of South Australia. See Figure 16 for Endlicher's reproduction of Bauer's drawing.

Exocarpos cupressiformis Labill. (Bennett 3207 p.p.)

Geranium potentilloides L'Her. ex DC. (Bennett 5224 p.p.)

Hakea leucoptera R.Br. (Bennett 3376) Type collection of species. Fig. 3 shows the lectotype collection in the Natural History Museum (BM) in Britain.

Heliotropium asperrium R.Br. (Bennett 2921) Type collection of species.

Heliotropium glandulosum R.Br. (Bennett 2920) Type collection of species. Synonym of *H. europaeum* L. and the basis for now considering this to be a native, rather than introduced species (Craven 1996)

Humea punctulata F. Muell (Bennett 2153) [Brown's annotation: Nov genus]

Ixiolaena tomentosa Sond. & F.Muell. ex Sond. = *Leiocarpa tomentosa* (Sond.)Paul G. Wilson (Bennett 2161)

Jasminum lineare R.Br. (Bennett 2839) Type gathering of species.

Lavatera plebeia Sims (Bennett 5144) [Brown's annotation: *Lavatera dubia*] = *Malva australiana* M.F.Ray

Lepidium sp. indet. (Bennett 5271)

Maireana aphylla (R.Br.)Paul G. Wilson (Bennett 3085) Type of *Kochia aphylla* R.Br. [Brown's annotation: *Salsola aphylla*]

Nicotiana sp. [probably *N. velutina* H.-M.Wheeler or *N. goodspeedii* H.-M.Wheeler] (Bennett 2684) [Brown's annotation: *Nicotiana didyma*]. There is a Tate collection of *N. velutina* from Mt Brown in 1881 (*pers. comm.* David Symon, August 2002).

Olearia pannosa Hook. ssp. *pannosa* (Bennett 2226) [Brown's annotation: *Asteroides*]

Phragmites australis (Cav.)Trin. ex Steud. (Bennett 6259)

Pycnosorus globosus Bauer ex Benth. (Bennett 2143)

Pimelea sp. indet. (Bennett 3191 p.p.)

Psoralea patens Lindl. (Bennett 4135)

Rhagodia parabolica R.Br. (Bennett 3041) Type gathering of species.

Santalum spicatum (R.Br.)A.DC. (Bennett 3213). Type of *Fusanus spicatus* R.Br. [Brown's annotation: *Eucarya spicatus*]

Scaevola humilis R.Br. (Bennett 2561). Type gathering of the species.

Sida petrophila F. Muell. (Bennett 5197)

Sigesbeckia orientalis L. (probably *S. australiensis* D.Schultz for Bay XII) (Bennett 2111)

Senecio odoratus Hornem (Bennett 2305) [Brown's annotation: *Senecio assimilis*]

Teucrium racemosum R.Br. (Bennett 2388) Type gathering of species.

Themeda triandra Forssk. (Bennett 6194 p.p.) [Brown's annotation: *Anthistiria australis*] Part of the type gathering of *Anthistiria australis* R.Br.

Trichodesma zeylanica (Burm.f.)R.Br. (Bennett 2933) [Brown's annotation: *Borago zeylanica*]

Velleia paradoxa R.Br. (Bennett 2548) Base of the mountains near Inlet XII South Coast. Part of type gathering of species?

Zygophyllum sp. indet. (Bennett 5222)

Robert Brown's own plant list for Mt Brown (10–11 March 1802)

Robert Brown compiled his own list of plants for Mt Brown. This was apparently compiled well after the ascent and when he was back in England since the paper it is written on is watermarked "1819" (Vallance et al. 2001). This list has been reproduced below, with plants in the original order, since it differs somewhat from the extant collection list given above. For example, Brown lists three *Eucalyptus* species but there are no collections extant and so we can only speculate as to the identity of these species. Similarly he lists three *Acacia* species, but in this case there are four extant collections. The plant names Brown provided on his list are given in bold.

Cheilanthes: [*Cheilanthes lasiophylla* Pic. Serm.] (Bennett 4b)

Agrostis: *Sporobolus virginicus* (L.)Kunth – no specific collection from Inlet XII but Bennett 6209 is from the South Coast.

Triodioides pungens: porcupine grass or spinifex [*Triodia* sp. – not Bennett 6258 as cited in Vallance et al. (2001) since this is the type of *Triodia irritans* from St Francis Island. The species is common on Mt Brown]

Arundo Phragmites: [*Phragmites australis* (Cav.)Trin. ex Steud.] (Bennett 6259 p.p.)

Pappophorum nigricans: [*Enneapogon nigricans* (R.Br.)Beauv.] (Bennett 6249 p.p.)

?**Anthistiria australis:** [Kangaroo Grass *Themeda triandra* Forssk. (Bennett 6194 p.p.)]

Cyperus: [*Cyperus vaginatus* R.Br.] (Bennett 5922 p.p.)

Typha angustifolia L. (bulrush): no specimens traced but it is still to be found at the spring at the base of the mountain.

Xanthorrhoea apparently a distinct specimen the side of Mount Br: *X. quadrangulata* F.Muell. (no specimen traced, but common on the hillsides)

Calostemma purpureum in Mount Br: [*C. purpureum* R.Br.] (Bennett 5641): type gathering. [Brown's annotation: *Pancratium purpureum*]

Hakea: [*H. leucoptera* R.Br.] (Bennett 3376)

Salicornia (2): no specimens traced. *Salicornia arbuscula* R.Br. and *Salicornia indica* Willd. are both listed by Brown for the south coast; these become *Sclerostegia arbuscula* (R.Br.)Paul G. Wilson and *Halosarcia indica* (Willd.) Paul G. Wilson respectively, but there are no specimens of these for Inlet XII.

Kochia aphylla: *Maireana aphylla* (R.Br.)Paul G.Wilson (Bennett 3085).

Sclerolaena paradoxa: *Dissocarpus paradoxus* (R.Br.)F. Muell. ex Ulbr. (Bennett 3077).

Salsola australis R.Br.: [although Brown includes it in his list for Inlet XII, the only extant specimen is from Petrel Bay, St Francis Island] = *Salsola kali* L. (Dryander dupl.)

Anisacanthia divaricata: *Sclerolaena divaricata* (R.Br.)Sm. (Bennett 3078)

Fusanus This is probably the species providing the spherical fruit: *Santalum spicatum* (R.Br.)A.DC. (Bennett 3213).

Boerhaavia: *Boerhavia coccinea* Mill. (Bennett 3009) – Brown says “in montibus”.

Euphorbia: [? *Euphorbia drummondii* Boiss. = *Chamaesyce drummondii* (Boiss.)D.C.Hassall] No specimen found.

Callitris: *Callitris glauca* of Brown (Bennett 3108) = *C. gracilis* R.T.Baker

Casuarina acida: ?*Allocasuarina verticillata* (Lam.)L. A.S.Johnson (no specimen traced)

Dodonaea (2): there are four collections from this locality, *Dodonaea baueri* Endl. (Bennett 5429 p.p.); *D. stenozoya* F.Muell. (Bennett 5443); *D. viscosa* Jacq. ssp. *angustissima* (DC.)J.G.West (Bennett 5434 p.p.); *D. lobulata* F.Muell. (Bennett 5444).

Plantago: probably *Plantago hispida* R.Br. (no specimen located)

Solanum: identity unknown, no specimens traced. *Solanum ellipticum* R.Br. is common at this locality, and there is a specimen (Bennett 2683) collected from the “South Coast”, but this specimen is attributed to Baudin by Brown. This seems strange since Baudin did not land in any area in South Australia where he might have collected this species. The identification needs to be checked and if correct, then the attribution to Baudin questioned. The same comment applies to the listing of the *Heterodendrum* collection from this locality (q.v.). Both collections attributed to Baudin are more likely to have come from the Western Australian coast-line. Presumably Brown recognised that they were present at Bay XII and so included them in the list for here.

Nicotiana: probably *N. velutina* H.-M.Wheeler (Bennett 2684)

Halgania the small flowered species but with flower: *H. cyanea* Lindl. (Bennett 5482), the only *Halgania* species in the Brown database is not listed for Inlet XII or Mt Brown, but for Inlet XIV, the top of St Vincent’s Gulf.

Heliotropium: there are two specimens housed in BM, one as *H. asperrimum* R.Br. (Bennett 2921), the type of the species and the other as *H. glandulosum* R.Br. (Bennett 2920), also the type of the species. The latter is now treated as *H. europaeum* L. by Craven and the Brown collection is cited as the reason for now considering this species to be native to Australia (Craven 1996).

Trichodesma: *Trichodesma zeylanicum* (Burm.f.)R.Br. (Bennett 2933 p.p.)

Teucrium (cf No 57 Cunningham): *T. racemosum* R.Br. (Bennett 2388)

Cynanchium: *Cynanchum floribundum* R.Br. (Bennett 2874).

Stenochilus longifolius: *Eremophila longifolia* (R.Br.)F. Muell. (Bennett 2339)

Eremophila oppositifolia R.Br.: (Bennett 2341).

Eremophila alternifolia R.Br.: (Bennett 2340).

Jasminium lineare: [*Jasminum didymum* Forst.f. ssp. *lineare* (R.Br.)P.Green] (Bennett 2839)

Velleia: [*V. paradoxa* R.Br. (Bennett 2548) – from base of mountains]

Scaevola spinescens: no specimens found but this species

was collected from the mountain in 2001. *Scaevola humilis* R.Br. (Bennett 2561) was collected by Brown, but not listed by him.

Convolvulus: *Convolvulus remotus* R.Br. or *C. microsepalus* R.W.Johnson (Bennett 2766 p.p.)

Avicennia: *A. marina* (Forssk.)Vierh. var. *marina* (no specimen traced). Mangroves were not mentioned for Bay XII, but perhaps a sight record, since Good refers to them on the evening of their reaching the top of the gulf.

Sigesbeckia orientalis “on the side of Mt Brown”: possibly the native *S. australiensis* D.Schultz rather than the introduced *S. orientalis* L. (Bennett 2111). Identification needs to be checked.

Aster (2): specimens identified as *Olearia axillaris* F.Muell. (Bennett 2248) and *Olearia microphylla* (Vent.)Maiden & Betche (Bennett 2250) both bear the annotation “Aster” from the “South Coast”, with no mention of Inlet XII.

Senecio (2): *Senecio odoratus* Hornem. (Bennett 2305). Other *Senecio* species collected from here in 2001 were *S. pinnatifolius* A.Rich., *S. glossanthus* (Sond.)Belcher and *S. quadridentatus* Labill.

Craspedia: *C. globosa* (Bauer ex Benth.)Benth. (Bennett 2143) = *Pycnosorus globosus* Bauer ex Benth.

Cartodium: *Calocephalus citreus* Less. (Bennett 2142 p.p.)

“Antennarioides”: nothing located with this annotation.

The name suggests a resemblance to *Antennaria*, which according to Philip Short (pers. comm. 20 Aug 2001) is a gnaphaliod genus and is grouped with genera such as *Haeckeria* and *Cassinia*. The name then may refer to any one of the following composites collected by Brown at this locality: *Cassinia arcuata* R.Br. (Bennett 2152); *Cassinia laevis* R.Br. (Bennett 2151); *Humea punctulata* F.Muell. (Bennett 2153 p.p.) = *Haeckeria punctulata* (F.Muell.)J.H.Willis.

Loranthus (2): Identified as *A. pendula* (Bennett 2952) above; more likely *Amyema miquellii* (Lehm.ex Miq.)Tiegh.

Lepidium: *Lepidium* indet. (Bennett 5271) – a number of native species possible

Lavatera: *Lavatera plebeia* Sims (Bennett 5144) = *Malva australiana* M.F.Ray

Sida: *Sida petrophila* F.Muell. (Bennett 5197)

Oxalis: ?*O. peremans* Haw. (no Brown specimen found, but Dryander duplicate from “South Coast”)

Heterodendrum: *Alectryon oleafolius* (Bennett 5475). Apparently collected and named from Baudin’s collection which almost certainly would have come from the Western Australian coast-line. .

Psoralea: *P. australasica* (Bennett 4135) now *Cullen australasicum* (Schtdl.)J.W.Grimes

Lotus: *L. australis* Andrews or *L. cruentus* Court (no specimen for Bay XII found, but there is a collection (Bennett 4171) from Inlet XIV, the top of St Vincent Gulf)

Indigofera: No specimens in the BM database. They may be on loan.

Cassia (3):

Cassia eremophila (Bennett 4335) = *Senna artemisioides* (DC.)Randell ssp. *coriacea* (Benth.)Randell

C. phyllodinea R.Br. (Bennett 4253) = *Senna artemisioides* (DC.)Randell ssp. *petiolaris* Randell (illustrated by Bauer, see above)

Cassia sturtii var. *coriacea* (Bennett 4334) = *Senna artemisioides* (DC.)Randell ssp. *coriacea* (Benth.)Randell

Acacia (3):

A. papyrocarpa Benth. (Bennett 4343);

A. salicina Lindl. (Bennett 4345);

- A. myrtifolia* (Sm.) Willd. (Bennett 4347 p.p.) – the identification needs to be checked as it does not occur in this area today.
Acacia longifolia (Andrews) Willd. also listed for Bay XII in database (Bennett 4271)
Eucalyptus (3) – no specimens traced. *E. porosa* F. Muell. ex Miq. and *E. socialis* F. Muell. ex Miq. are suggested.

Peter Good's seed list from Bay XII

- Alectryon* [*Alectryon oleifolius* (Desf.) S. Reyn. or Bullock-bush]
Cassia simplicifolia [*Senna artemisioides* (DC.) Randell]
Oxalis [*Oxalis perennans* Haworth – there is a Dryander duplicate of a Brown specimen in BM, but it has no specific locality details, merely 'South Coast' and the annotation 'Oxalis arida' by Brown.]
Mimosa [*Acacia*] *linearifolia*
 — species [*Acacia* species]
 — foliis pinnatis cinereis [probably *Senna artemisioides* ssp. *coriacea* – see Brown's manuscript name above]
Teucrium [probably *T. racemosum* R. Br. – the type is from here]
Cartodium microcephalum [usually used by Brown for *Calocephalus* species, and so possibly *C. brownii* F. Muell.]
Dodonaea longifolia [probably *D. viscosa* Jacq. ssp. *angustissima* (DC.) J. G. West]
Gen viticum sem [seed] only in decay [*Eremophila* sp. – Bennett 2341, 2337 each have a label bearing the annotation "Gen Viticum Inlet 12", while Bennett 2338 has a label bearing the annotation "Gen viticum Bay 3–4 Inlet 12 South Coast". These are probably Peter Good's contribution to the collection.]
Mimosa [*Acacia*] *crassifolia* one seed
Xeranthemum [used by Brown for the *Helichrysum* group of species]
Gen Jasminiar [*Jasminum didymum* R. Br. ssp. *lineare* – the type was collected from here by Brown]
Heliotropium aridum [*Heliotropium asperum* R. Br. or *Heliotropium europaeum* L. – Brown's collection of this was from Bay XII; he apparently considered it to be different from *H. europaeum*]
Syngenesist Frutex foli ovali dentati viscidis [composite with leaves oval and toothed, viscid]
Asteroides foliis ovatis subtus lanatus montis [a daisy, possibly *Olearia*]
Goodenia
Nicotiana [*Nicotiana* species listed]
Composit fol glaucus sem pappo [a daisy]
Gen viticum drupa baccata 4 loc nucleo solitaris [*Eremophila* sp.]
Anthisteria [*Themeda triandra* Forssk.]
Cartodium lanatum [*Calocephalus*]
Gen composit cal contorti imbricat [a member of the Compositae or daisy family]
Aster sp [a daisy, probably *Olearia*, possibly *Olearia muelleri* (Sond.) Benth., for which Brown's manuscript name was *Aster fulcatus*]
Dodonaea dentata [*Dodonaea lobulata* F. Muell.]
Lepidium fol filiformi: floribus haud observatis insaxosis aridis in latim montes [*Lepidium* species listed]
Gen viticum stam didynam: cor irregularis coerulea [*Eremophila* sp. – see comments above]
Syngenesist flosculosi: sem pappos papillio capillare sessile foliis lanatis incanus [daisy]
Melilotus [usually considered to be European introductions. Used as a medicinal and also for grazing at this time. Possibly confused with something else with trifoliate leaves – perhaps *Goodia* or *Cullen*]

- Gnaphalium affn G. aureum* Sol [a daisy, possibly one of the forms of *Chrysocephalum apiculatum* (Labill.) Steetz]
Conchium affn aciculare [*Hakea leucoptera* R. Br.]
Salsoloides echinata [one of the chenopods]
Pittosporum tenuifolium [presumably the easily recognised *P. phylliraeoides* DC., now known as *P. angustifolium* Lodd.]

Bay XIII, Kangaroo Island
 (21–24 March & 1–7 April 1802)

21st March. Anchored off Kangaroo Island, off Kangaroo Head¹⁶, at 7 p.m.

22nd March. Brown and Good went ashore early, walking along the edge of the scrub for about a mile and a half west of the landing place. Brown made comments about the geology, the soils and several ravines running at right angles to the shore. He surmised that these would have water in the wet season and found two frogs in support of his suggestion.

He commented that the number of trees was low, consisting chiefly of:

Mimosa insularis [probably *Acacia paradoxa* DC.], mixed with *Casuarina equisetifolia* [*Allocasuarina verticillata* (Lam.) L. A. S. Johnson], two species of *Eucalyptus* [one of these would be *Eucalyptus cneorifolia* DC.], *Mimosa fucata* [this name used for *Acacia dodonaeifolia* (Pers.) Balb. elsewhere] and *Dodonaea viscosa*, a similar tree to *Mimosa fucata*.

Western Grey kangaroos were in abundance and quite tame, this tameness suggesting to the party that they were on an island. Thirty were killed for food and gave their name to the island. Brown commented on their colour variation and also on the presence of the smaller species [Tammara wallaby], pelicans, pigeons, parrots and the seals.

A spring was found by the party which had walked to the east [Frenchmans Rock].

23rd March. Brown stayed on board but Good went ashore in the morning and headed east, at least as far as the spring. He commented that the kangaroos had now become wary and the shooting party were not very successful. He saw four emus and found several new plants which were listed by Brown.

Amongst the plants was a tree of *Bursaria spinosa* Cav. of considerable girth, a new *Eucalyptus* species, and a *Limosella* species [suggesting areas which had only just dried out]. A number of small birds of uncertain identity were shot.

24th March. Departure in the morning to map St Vincent Gulf.

2nd April. Anchorage in Nepean Bay, to the west of the previous anchorage, at midnight on 1st April.

Brown and Good went ashore, probably walking south along the shore of Eastern Cove for about a mile and a half, and making occasional incursions into the

¹⁶ Present-day Hog Point (Cooper 1953, Matheson 2001).

vegetation. Trees and shrubs were considered the same as those seen before, but the soil inferior to that at the earlier landing place. Enough kangaroos were killed by the hunting party for all of the crew to have fresh provisions.

Bauer accompanied Flinders to a sandy beach at the top of the bay, probably Island Beach. He saw four emus within pistol shot, but there is no record of their having been collected. The French collection of emus from Kangaroo Island a year later are the only collections still surviving and since they were smaller and darker these were named as a distinct species (*Dromaius baudinianus*) by Parker in 1984. The ship's log recorded the sighting of a skin of an echidna (Vallance et al. p. 172).

3rd April. The ship was meant to move out to continue mapping but Flinders found that the timekeepers had stopped. He decided to stay an extra three days and a station was set up on shore. Wooding parties were sent out and a shooting party. Brown and Good stayed aboard.

4th April. Brown left at 5.30 a.m. with Flinders in the cutter, intending to climb a hill visible behind the bay [Mt Thisby or Prospect Hill]. Brown recorded seeing a few new plants and a number of birds, particularly pelicans breeding on the small islands in the inlet. They reached the base of the hill at 11 a.m. and after 12 they climbed to the top and took bearings. Brown later described the view at some length in his diary. Having returned to the cutter they explored the eastern inlet [Pelican Lagoon], landing at several places, before making camp for the night at American River. The boobook or mopoke owl was heard calling during the night

Good on the other hand, went off early with Westall and Allen, carrying provisions for 2 days. He recorded climbing up a gully near the East point and from there making his way to the summit of the hills, but the trees were so thick that a view was not possible. He found a few new plants and that evening made his way to the spring (Frenchmans Rock) where he found Westall and Allen. They all spent the night here.

5th April. Brown and Flinders' party rowed to the mouth of the inlet, stopping in a few places to look for kangaroos. Oysters, similar to those of Oyster Harbour at King George Sound (Albany), were found at the mouth of the inlet. They were back on board ship by 10.30 a.m., bringing with them some pelicans.

Good took a walk through the scrub again, shooting a parrot and a kangaroo, whereas Westall and Allen had little success in this same pursuit. At least nine emus were seen but none taken, even though they were in range several times. Good must have at some stage this day planted his European seeds at the spring (see Fig. 11 reproduction of this list). Good also recorded a boat coming for them and it would appear that they may have had a pre-arrangement to meet at the spring. One of

the boating party, attempting to kill a seal with a stick, was severely bitten on the leg. The party arrived back on board about 6 that evening. A further sighting of 14 emus by a brush cutting party was noted by Good.

6th April. Departure from the anchorage early in the morning but by noon anchored nearly in the same place as on their first visit, due to an adverse current and wind. By 2 p.m., with a change of current, they were underway again but progress was slow and they anchor in Antechamber Bay at 11 p.m. for the night.

7th April. Good summarised his thoughts on the island which appeared to him "to be the most desirable place we have met with on the Coast of New Holland"

Brown's collections from Kangaroo Island (Bay 13) still extant

Acacia armata R.Br. ex Aiton (Bennett 4313 p.p.) = *Acacia paradoxa* DC. Part of type gathering of *A. armata* R.Br.

Atriplex paludosa R.Br. subsp. *cordata* (Benth.) Aellen (Bennett 3027). Type of *A. reniformis* R.Br. [Brown's annotation: *Atriplex reniformis*]

Atriplex pumilio R.Br. (Bennett 2323 = 3023) Type collection of species. This species is not listed as occurring on Kangaroo Island and the lectotype of the species is listed (*Flora of Australia* 4: 101) as coming from St Peter Island. [Brown's annotation: *Atriplex prostrata*]

Beyeria opaca F.Muell. (Bennett 3586 p.p.) – there are two *Beyeria* species on Kangaroo Island but not this one. The Kangaroo Island endemic is *B. subsecta* J.Black which is confined to the American River area. *B. lechenaultii* (DC.) Baill. is common along the coast and Brown also collected this species at Memory Cove, making it the more likely candidate. [Brown's annotation: *Crotonoides dyalifolia*]

Bulbinopsis semibarbata (R.Br.) Haw. (Bennett 5675 p.p.) = *Bulbine semibarbata* (R.Br.) Haw. Type of *Anthericum semibarbata* R.Br.

Callistemon rugulosus (D.F.K. Schldl.) DC. var. *rugulosus* (Bennett 4664) [Brown's annotation: *Metrosideros*]

Callitris gracilis R.T. Baker (Bennett 3109) [Brown's annotation: *Callitris propinqua*]

**Chenopodium glaucum* L. (Bennett 3031 p.p.) – cosmopolitan in muddy eutrophic conditions and treated as an introduction in the South Australian census (W.R. Barker et al. 2005). If the identification is correct, should this now be considered native? [Brown's annotation: *Chenopodium ambiguum*]

Chenopodium pumilio R.Br. (Bennett 3033) Type gathering of species. Occurs as weed of agriculture today.

Correa sp. (Bennett 5316) [Brown's annotation: *Correa furfuracea*]

Correa sp. (Bennett 5312) [Brown's annotation: *Correa rubicunda*]

Dodonaea viscosa Jacq. ssp. *angustissima* (DC.) J.G. West (Bennett 5434 p.p.)

Eucalyptus anceps (R.Br. ex Maiden) Blakely (Bennett 4748 p.p.) Probably *E. rugosa* R.Br. ex Blakely [Brown's annotation: *Eucalyptus anceps*] *A. anceps* does not occur on Kangaroo Island.

Eucalyptus cladocalyx F.Muell. (Bennett 4800). [Brown's annotation: *Eucalyptus*] Present day distribution is mostly on the western end of the island with ?relict stand at Penneshaw.

- Eucalyptus cneorifolia* DC. (Bennett 4766) [Brown's annotation: *Eucalyptus stricta*] The type collection from Kangaroo Island was gathered by the French under Baudin in 1803.
- Eucalyptus grandis* W.Hill (Bennett 4799) Erroneous identification, eastern states species only. Possibly *E. leucoxylon* F.Muell.
- Eucalyptus incrassata* Labill. (Bennett 4750) This species does not occur on Kangaroo Island. [Brown's annotation: *E. sphenopoda*]
- Eucalyptus obliqua* L'Hér. (Bennett 4743). [Brown's annotation: *Eucalyptus* 46]. Not found on the eastern end of the island – possibly *E. diversifolia* Bonpl.
- Eucalyptus oleosa* F.Muell. (Bennett 4770 p.p.)
- Eucalyptus viminalis* Sm. (Bennett 4744 p.p.) ssp. *cygnetensis* Boomsma.
- Haloragis mucronata* (Nees) Benth. (Bennett 4434). This is *Haloragis acutangula* F.Muell. Form is unknown since the specimen is flowering only. [Brown's annotation: *Haloragis littoralis*]
- Hibbertia stricta* (R.Br. ex DC.) F.Muell. (Bennett 4880 p.p.) – identification still to be clarified. [Brown's annotation: *Curatelloides/Pleurandra taxifolia*]
- Ixiolaena supina* F.Muell. (Bennett 2159 p.p.) [Brown's annotation: *Chrysocomoides penicellatum*]
- Limosella australis* R.Br. (Bennett 2698 p.p.) Part of type gathering of species.
- Melaleuca acuminata* F.Muell. (Bennett 4688 p.p.)
- Melaleuca* sp. (Bennett 4704). Attributed to *M. armillaris* (Sol. ex Gaertn.) Sm. in Brown database, but this species does not occur on Kangaroo Island.
- Orthrosanthus multiflorus* Sweet (Bennett 5618). Published as *Sisyrinchium cyaneum* Lindl. in *Edwards Bot Reg.* 13 (1827) t. 1090 – see Fig. 10 [Brown's annotation: Cfr *Diplarenhia*]
- Plantago varia* R.Br. (Bennett 2985) Type collection of species. [Brown's annotation: *Plantago* cfr *polymorpha* & *scabrum*]
- Rhagodia crassifolia* R.Br. (Bennett 3038). [Brown's annotation: *Chenopodium crassifolium*] Part of the type gathering of the species.
- Rhagodia nutans* R.Br. (Bennett 3044). = *Einadia nutans* (R.Br.) A.J.Scott ssp. *nutans* [Brown's annotation: *Chenopodium prostratum*] Climbing or nodding saltbush.
- Scutellaria humilis* R.Br. (Bennett 2354 p.p.). Part of type gathering of species.
- Senecio odoratus* Hornem (Bennett 2304 p.p.) [Brown's annotation: *Senecio polymorphus*]
- Solanum* sp. (Bennett 2665 p.p.) [Brown's annotation: *Solanum laciniatum*]
- Vittadinia australis* A. Rich. (Bennet 2027). Probably *V. australasica* (Turcz.) N.T.Burb. var. *australasica* since *V. australis* does not occur in Australia – see Burbidge (1982). [Brown's annotation: *Erigeron diffusum*]
- Zygophyllum billardieri* DC. (Bennett 5221 p.p.) [Brown's annotation: *Zygophylloides octandra*]

Ferns

- Adiantum aethiopicum* L. (Bennett 70)
- Cheilanthes austrotenuifolia* Quirk & Chambers (Bennett 74). [Brown's annotation: *Adiantoides crispa*]
- Pleurosorus rutifolius* (R.Br.) Fee (Bennett 7 p.p.) [Brown's annotation: *Grammitis rutaefolia*].

Seed collections by Peter Good from Kangaroo Island (see Fig. 6)

- Anthericum* [*Bulbine semibarbata* (R.Br.) Haw. (Bennett 5675 p.p.)]
- Asteroides* [*Olearia* sp.]
- Saniculoides echinata* [*Sanicula* is a European genus of

- Apiaceae]
- Solanum laciniatum* [*Solanum laciniatum* Aiton]
- Mimosa fucata* [*Acacia dodonaeifolia* (Pers.) Balb. Brown's collections, Bennett 4341, from Memory Cove and Bay X have this name on them]
- Scutellaria plebeia* [*Scutellaria humilis* R.Br.]
- Nov Gen conifer [probably *Callitris gracilis* R.T.Baker (Bennett 3109)]
- Meterosideros* cf *M. saligna* [*Callistemon* sp., see comments above (Bennett 4664)]
- Dodonaea longiloba* [*Dodonaea ?viscosa* Jacq.]
- Eucalyptus* affn *E. saligna* Smith [*Eucalyptus* sp.]
- Mimosa* affn. *M. foliolia* [*Acacia ?paradoxa* DC.]
- Astragalus*?
- Gen *Iridem* affn forte *Sisyrinchiodes* [*Orthrosanthus multiflorus* Sweet – see Fig. 10]
- Asteroides sauevolens* [*Olearia* sp. – Brown later used this name on a collection of *Olearia tomentosa* (Wendl.) DC. (Bennett 2230) from Sydney, but the species does not occur in South Australia.]

Bay XIV, head of St Vincent Gulf (29 March – 1 April 1802)

29th March. Anchorage off Mangrove Point

30th March.

Getting to shore. At 6 a.m. Brown went with Flinders in the cutter to the head of the gulf to determine whether there was a river or not. Peter Good recorded that only one boat was sent because of the long distance to the shore and he stayed aboard on this occasion (as a result he listed no seed from this location). There were shoals for up to a mile and a half from the shore. These shoals were intersected by deeper channels and the cutter was able to make its way up one of these to within a quarter of a mile of the beach. The mangroves at the landing place and either side for a considerable distance were more luxuriant than any they had encountered before. Behind these grew two species of *Salicornia* which they had already seen at the head of Spencer Gulf (Bay XII).

The land traverse. The land was flat for a mile, then rose gently c. 200 feet. The country beyond this was of similar swells and covered with tufty grass and partly with low wood. No water was seen. Plants were similar to those at the head of Spencer Gulf (Bay XII) in the low land but they were nowhere near as numerous, and some on the raised ground were similar to those on Mt Brown.

The party saw what was possibly a Western Barred bandicoot, a black swan and other small birds, none of which was shot. A hawk was shot by Flinders from the boat and this is probably now housed in the Natural History Museum in London.

Brown remarked on a “long, flattish topped hill about 8 miles distant” which was probably the end of the chain of mountains they had encountered at the head of Spencers Gulf. This was the South Hummocks. Good recorded that the intention was to get to this highest point but it was further than expected, and so unlike the Mt Brown occasion, the party returned. The party was

back in the boat at 4 p.m., and on board ship again at 7 p.m.

Brown's collections at Bay XIV (head of St Vincent Gulf) still extant

- Acacia oswaldi* F.Muell. (Bennett 4342)
Acacia salicina Lindl. (Bennett 4345 p.p.)
Brachyscome ciliaris (Labill.)Less. (Bennett 2069) [Brown's annotation: Micropogon/Inter Bellidem & Micropogon]
Calotis erinacea Steetz (Bennett 2045) [Brown's annotation: Cotuloides]
Dodonaea baueri R.Br. (Bennett 5429 p.p.) [Brown's annotation: Dodonia repola]
Eremophila longifolia (R.Br.)F.Muell. (Bennett 2339 p.p.) [Brown's annotation: Stenochilus longifolius/Gen vitie]
Halgania strigosa Schldl. = *H. cyanea* Lindl. (Bennett 5482) [Brown's annotation: An genus Malvae]
Lotus australis Andr. (Bennett 4171) [Brown's annotation: Lotus amarus]
Myoporum platycarpum R.Br. (Bennett 2798) Type collection of species.
Olearia pannosa Hook. (Bennett 2229)
Rhagodia spinescens R.Br. (Bennett 3042) Type collection of species.
Sida corrugata Lindl. var. *corrugata* (Bennett 5102). [Brown's annotation: Sida prostrata.] Part of the Natural History Museum (BM) collection can be seen in Fig. 3.

South Coast plants with no specific locality details in the Brown database.

A number of Angiosperm species collected by Brown have no other attribution than South Coast and there is usually no way of assigning them to a particular locality, particularly as some of them are common coastal species e.g. *Logania ovata* and *Wilsonia humilis*. Some of them may not have even come from South Australia e.g. *Solanum ellipticum*.

The other group of collections for which it is difficult to give locations are the algae. When the Brown database was accessed on 18 Jan 2002 and a search carried out for algal collections it was found that there were 37 Phaeophyta, 28 Rhodophyta and 4 Charophyta listed. Most of these are merely annotated "South Coast". Four of these were doubtfully attributed to South Australia in the database, although the basis for this was not clear. Brown specifically mentioned a collection of algae from Anchorage VI (Waldegrave Island: see above), but this locality was not given for any of the specimens listed in the database.

There were also twenty Bryophytes listed in the database when it was accessed on 18 Jan 2002. None of these was attributed to South Australia.

- ?*Acrotiche ovalifolia* R.Br. = *A. cordata* (Labill.)R.Br. (Bennett 2471). 'King George Sound to Bay 9'. Type gathering of *A. ovalifolia* R.Br.

- Clematis microphylla* DC. (Bennett 4853) – Peter Good lists a seed collection from Memory Cove.
Juncus pallidus R.Br. (Bennett 5790). Part of the type gathering.
Helichrysum semipapposum (Labill.)DC. (Bennett 2185, 2188) = *Chrysocephalum semipapposum* (Labill.)Steetz [Brown's annotation: Chrysochaete]
Logania ovata R.Br. (Bennett 2904) Type gathering of species.
Olearia axillaris F.Muell. (Bennett 2248) [Brown's annotation: Aster australis]
Olearia glandulosa (Labill.)Benth. (Bennett 2022) [Brown's annotation: Asteroides glabrata]
Olearia microphylla (Vent.)Maiden & Betche (Bennett 2250) [Brown's annotation: Aster]
Olearia muelleri (Sond.)Benth. (Bennett 2019). [Brown's annotation: Aster fulcatus]
Oxalis perennans Haw. (Dryander duplicate) [Brown's annotation: Oxalis arida] Brown mentioned an Oxalis in flower for Bay X and listed it for Mt Brown. Peter Good included it in his seed list for Mt Brown.
Solanum ellipticum R.Br. (Bennett 2683). Annotated as "Solanum a D. Baudin south Coast 1802" suggesting that this specimen was obtained from Baudin. If this was the case then the specimen must have been collected from the Western Australian coastline since Baudin had no opportunity to collect *Solanum ellipticum* from South Australia to this time¹⁷. The specimen also suggests that there was an exchange of specimens, either at the time of the Encounter or while both parties were in Sydney in 1802.
Wilsonia humilis R.Br. (Bennett 2787 p.p.). Part of type gathering of species

Erroneous locality

- Xanthoparmelia australiensis* (Cromb.)Hale (Bennett 525) was probably collected in South Australia, and later erroneously labelled as coming from Tasmania (Groves & Moore 1989).

Algae attributed as having possibly been collected in South Australia

Phaeophyta

- Cystophora retroflexa* (Labill.)J.Ag. (Bennett 209, two labels). Brown's annotations as *Fucus ramosissimus* and *Fucus retroflexus* Labill.
Scytothalia dorycarpa (Turn.)Grev. (Bennett 216, 2 sheets). Brown's annotations as *Fucus platycarpus* and *Fucus dorycarpus* Turn.
Platythalia quercifolia (R.Br. ex Turn.)Sond. (Bennett 217, 3 labels). Brown's annotations as *Fucus quercifolius*, *Fucus quercifolius* and *Fucus quercifolius* Turn.
Cystophora sp.indet. (Bennett 219). Brown's annotations as *Fucus vagus*

Rhodophyta

- Pterocladia lucida* (R.Br. ex Turn.)J.Ag. (Bennett 266). Brown annotation as *Fucus lucidus*

¹⁶ If the collection came from South Australia, on present day distribution *Solanum ellipticum* could only have been collected from the top of Spencer Gulf. It has already been indicated that Baudin only collected from Kangaroo Island and St Peter Island in the year following the Encounter.

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State Herbarium of South Australia
PO Box 2732
Kent Town SA 5071
Australia



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Lists of gypsophilous plants from southern Australia

David E. Symon

State Herbarium of South Australia,
Hackney Road, Adelaide, South Australia 5000
Email: symon.david@saugov.sa.gov.au

Abstract

An annotated list is provided of plants that appear to be gypsophilous. About 14 species may be considered obligate gypsophiles: *Asteridia archeri*, *Austrostipa geoffreyi*, *Austrostipa nulla nulla*, *Calytrix gypsophila*, *Embadium johnstonii*, *Goodenia gypsicola*, *Kippistia suaedifolia*, *Lawrencia helmsii*, *Melaleuca nanophylla*, *Minuria gardneri*, *Minuria multiseta*, *Nicotiana burbidgeae*, *Nicotiana truncata*, *Senecio gypsicola*. A further 233 species are facultative gypsophiles, being clearly tolerant of high concentrations of gypsum but much more widely spread. Fifty-six species of naturalised plants were recorded from gypsum deposits in South Australia in field surveys by the author; all species would be considered facultative gypsophiles.

Introduction

Gypsum ($\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$), a calcium dihydrate, occurs widely in drier southern and interior Australia. It may be present in three main forms: as *kopi*, a white floury powder (gypsite); seed gypsum (crystalline gypsarenite), a porous granular state; or rock gypsum (selenite), in larger aggregates. The latter may form rock-like masses or occur at times as glass-like plates. *Kopi* is an Aboriginal word for a mourning cap made of gypsum and was used by the Aborigines near the junction of the Darling and Murray rivers (Curr 1886–87).

Accounts of gypsum in South Australia may be found in Jack (1921) and in Western Australia in De la Hunty & Low (1958) and Jones (1993). Many localities are itemized and chemical analyses given but in neither of these are there any botanic details.

A substantial account of gypsum in New South Wales is given by Wynn (1965). This showed that gypsum is found in many localities in the Western Division and with few exceptions in areas with less than 375 mm (15 inches) average annual rainfall. The only plant species mentioned is *Nicotiana glauca* (tree tobacco) with the comment “Although not specific for the mineral... the plant grows profusely on many deposits ...”.

An extensive account of gypsum deposits of Western Australia is provided by Jones (1993). These are mainly in the southern portion of the State and quite numerous. However, no plants are mentioned in this report. Considering the particularly interesting flora of southern Western Australia there is scope to investigate gypsophily in this area.

An account of gypsum deposits in Victoria was published by Thomas (1947). The deposits are principally in the north-west of the State but again no plants are mentioned.

The largest deposit in Australia is at Lake McDonnell on western Eyre Peninsula, 60 km west of Thevenard, South Australia (Forbes 1960a, 1960b; Anon. 2000). This extensive deposit averages 3.87 m thick and much of it is greater than 95% pure gypsum. Impurities are calcium carbonate and some sodium chloride.

Further accounts of gypsum in South Australia may be found in a popular account of the Arkaringa hills area, Deichman (1986) and King (1951) on Cooke Plains, and King (1952) on the Craigie Plains deposits.

Gypsum commonly occurs as dunes to the lee sides of salt lakes. In many cases this is on the east or south east side of the lakes. Many gypsum dunes taper down to the saline lake systems at their base making the separation of salt tolerant and gypsophilic species difficult. A great many herbarium labels lack any critical distinction between these two categories. The mere sighting of samphires prompts a response that the area must be saline. The summit of the dunes may be more or less pure gypsum or with thin leaf mould when well vegetated and the lower slopes often have thin to deep layers of loam covering the gypsum. A number of small annual herbs live in the shallow mould above the gypsum and it is difficult to know whether these are truly gypsophilous or merely tolerant.

The face of the mining cut through the dune at Cooke Plains, South Australia shows mallee roots descending almost vertically through 4 m of gypsum. The herbaceous perennial *Microseris scapigera* may have its tubers completely developed in floury white *kopi*. The roots of some *Austrostipa* clearly penetrate gypsum to considerable depths, and shrubs at such sites (e.g., *Atriplex*, *Maireana*, *Rhagodia*, *Lawrencia*) clearly have their permanent root systems well into the gypsum whatever the surface veneer may consist of.

Parsons (1976) published a review of gypsophily in plants. This dealt largely with the ability of plants to metabolise the sulphur in gypsum. It contained references to principal gypsum deposits elsewhere in the world and included some species lists. Only five Australian species were listed, all of which are included in the present lists.

Chippendale (1963) describes some of the gypsophilous plants and the ecological succession on the margin of Lake Amadeus. A list of plant species is given in the ecological gradient from the edge of the saline lake surface to the edge of the gypseous sands. From the saline margin to the edge of the gypseous sands they included *Plagianthus* (now *Lawrenia*) *glomeratus*, *Pachyornis* (= *Sclerostegia*) *tenuis*, *Frankenia cordata*, *Arthrocnemum halocnemoides*, *Bassia* (= *Maireana*) *leuhmannii*, *Bassia* (= *Sclerolaena*) *birchii*, *Zygophyllum compressum*, *Atriplex vesicaria*, *Chenopodium nitriaceum*, *Hakea leucoptera*, *Melaleuca glomerata* and *Eremophila macdonnellii*. However the ecological gradient was steep and the analysis complicated by blown red sand.

The only account that provides a near comprehensive listing of gypsophilous plants for a region in Australia that I have located is one by Mattiske Consulting (1995–96) for the Department of Conservation and Land Management, Perth, which examined the “botanical values on a range of gypsum dunes in the wheat belt of Western Australia”. The report includes a large list of plants collected, many of which are gypsum tolerant, and does include about 30 species “present mostly at high gypsum sites”. These have been incorporated into this report.

O’Keefe (2003) in an article on gypsophily in Victoria, makes a plea for more knowledge of gypsophiles in Australia. The author records three classes of gypsophily:

- Obligate gypsophiles
- Facultative or non-differential gypsophiles
- Halophytic gypsophiles

Very few plant species are named.

Indigenous gypsophilous plants in southern Australia: evidence from plant collections and literature

Methods

Data from herbarium collections and the literature have been assembled to provide a list of gypsophilous plants, contained in the Appendix to this paper.

The list of actual and suspected gypsophiles contained in the Appendix are based substantially on herbarium label data and on recent collections by R. Bates, F. Badman and the author. It also incorporates data from the few published accounts available: Chippendale (1963), Mattiske (1995–96) and O’Keefe (2003), together with label data from the State Herbarium of South Australia (AD), the Herbarium of the Northern Territory (DNA, NT) and the Western Australia Herbarium (PERTH).

Occurrences relate to South Australia unless otherwise stated.

Nomenclature follows the *Census of South Australian Vascular Plants* (Barker et al. 2005).

The original intention of the following lists was to provide one of truly gypsophilous plants substantially confined to gypseous soils and a second list of gypsum tolerant species. Because of a lack of critical collecting details, this was more difficult than expected. In addition, a much greater number of species was rapidly found whose habitats extended widely beyond recognised gypsum fields.

More often than not label data is inadequate and in most cases notes made by the collector cannot be checked. Where a single label record of gypsum has been found commonsense assessments have been made. The term “likely sites” is used repeatedly in the text where a number of collections come from possible sites but do not actually mention gypsum.

May I plead for more careful and more detailed collecting notes on the soils on which your worthy specimens grow.

Results

From the specimen and literature survey, just 14 species are likely to fall into O’Keefe’s (2003) category of “obligate gypsophiles”:

- Asteridia archeri* – Compositae
- Austrostipa geoffreyi* – Gramineae
- Austrostipa nulla nulla* – Gramineae
- Calytrix gypsophila* – Myrtaceae
- Embadium johnstonii* – Boraginaceae
- Goodenia gypsicola* – Goodeniaceae
- Kippistia suaedifolia* – Compositae
- Lawrenia helmsii* – Malvaceae
- Melaleuca nanophylla* – Myrtaceae
- Minuria gardneri* – Compositae
- Minuria multisetata* – Compositae
- Nicotiana burbridgeae* – Solanaceae
- Nicotiana truncata* – Solanaceae
- Senecio gypsicola* – Compositae

The other 233 species seem best considered as facultative gypsophiles.

A survey of weeds at South Australian gypseous sites

Methods

Between 2000 and 2006 nine gypseous sites in South Australia were surveyed by the author for occurrences of naturalised plants. Sites visited were:

- Lake Macdonnell, Eyre Peninsula
- Streaky Bay, Eyre Peninsula
- Yaninee, Eyre Peninsula
- Kopi, Eyre Peninsula
- Marion Lake, Yorke Peninsula
- Lake Fowler, York Peninsula
- Craigie Plain, Murray Lands
- Cooke Plains, South East
- Lake Gillies, Eyre Peninsula

The species located are listed in Table 1.

Table 1. Collections of naturalised plants obtained by the author from the nine sites in South Australia (*recorded in N.S.W by Wynn 1965)

Species	Lake Mac. donnell, EP	Streaky Bay, EP	Yaninee, EP	Kopi, EP	Lake Gillies, EP	Marion Lake, YP	Lake Fowler, YP	Craigie Plain, Murray Lands	Cooke Plain, SE
<i>Aira caryophylla</i>	+	.	.	.
<i>Anagallis arvensis</i>	+	+	+	.	.
<i>Arenaria leptoclados</i>	+
<i>Asphodelus fistulosus</i>	+	.	.	+	.	+	+	.	.
<i>Avellinia michelii</i>	+	.	.	.
<i>Avena barbata</i>	+	+	+	.	.	+	+	.	.
<i>Brachypodium distachyon</i>	+	.	.
<i>Bromus diandrus</i>	.	+	.	.	.	+	+	.	.
<i>Bromus rubens</i>	+	.	+	+	.
<i>Bupleurum semicompositum</i>	+	+	.	.	.	+	.	.	+
<i>Cakile maritima</i>	+	.	.
<i>Carduus tenuiflorus</i>	+	.	.
<i>Carrichtera annua</i>	+	.	.	+	.
<i>Centaurea melitensis</i>	+	+	.	.	.	+	.	.	.
<i>Cerastium semidecandrum</i>	+
<i>Erodium cicutarium</i>	+
<i>Euphorbia paralias</i>	+	.	.	.
<i>Euphorbia terracina</i>	+	.	.	.
<i>Fumaria muralis</i>	+	.	.
<i>Galium murale</i>	.	.	.	+	.	+	.	.	.
<i>Hedypnois rhagodioloideis</i>	+
<i>Hordeum glaucum</i>	+	+	.
<i>Hypochoeris glabra</i>	+	.	+	.
<i>Lagurus ovatus</i>	+	+	.	.
<i>Limonium campanyonis</i>	+	+	+	.	.
<i>Linum strictum</i>	+	.	.	.
<i>Lolium rigidum</i>	.	.	+	+	.	+	+	.	.
<i>Lycium ferocissimum</i>	+	+	.	+
<i>Malva dendromorpha</i>	+	.	.	.
<i>Medicago minima</i>	+	.
<i>Medicago polymorpha</i>	+	+	.	.
<i>Melilotus indica</i>	.	+	.	.	.	+	+	.	.
<i>Mesembryanthemum crystallinum</i>	.	.	.	+	.	.	+	.	.
<i>Mesembryanthemum. nodiflorum</i>	.	+	+	.	.	.	+	.	.
<i>Minuartia mediterranea</i>	.	+	+	.	.
<i>Moraea setifolia</i>	.	+	+	+	+
<i>Nicotiana glauca</i> *	+	.	.	.	+	.	+	.	+
<i>Oxalis pes caprae</i>	+	.	.
<i>Parapholis incurva</i>	+	+	+	.	.	+	.	.	.
<i>Plantago coronopus</i>	+	.	.	.
<i>Polypogon tenellus</i>	+	.	.	.
<i>Reichardia tingitana</i>	+	+	+	.
<i>Reseda lutea</i>	+	+	.	.
<i>Rostraria cristata</i>	.	.	.	+	.	+	.	.	.
<i>Rostraria pumila</i>	+	+	+
<i>Schismus barbatus</i>	.	+	+
<i>Silene nocturna</i>	.	+	+
<i>Sisymbrium erysimoides</i>	+	.
<i>Sonchus oleraceus</i>	+	+	+	.	.
<i>Sonchus tenerrimus</i>	.	.	+	+	.
<i>Spergularia diandra</i>	.	+	+
<i>Spergularia marina</i>	+	.	.
<i>Trifolium compestre</i>	+	.	.
<i>Vulpia fasciculata</i>	+	.	.
<i>Vulpia myuros</i>	.	+	.	.	.	+	.	.	.

All data is supported by voucher collections deposited in the State Herbarium of South Australia (AD).

Results

The survey of naturalised gypsophiles indicates that plants collected are weedy, mostly annual plants. Using O'Keefe's (2003) classification of gypsophiles, there is no evidence that any of them are obligate gypsophiles. Like many successful weeds they are tolerant of varied ecologies and especially of disturbance.

Discussion

The relative paucity amongst the indigenous flora of obligate gypsophiles may reflect the relatively recent onset of aridity in southern Australia. Recency of origins similarly explains the lack of of obligate gypsophiles in the gypseous weed flora of South Australia, and the lower numbers compared with indigenous species.

This paucity is also paralleled in the poor development of succulence in the same geographical area compared with the rich succulent floras of arid areas in southern Africa or southern North America. In Australia stem succulence has developed in 2–3 species of *Euphorbia* (Euphorbiaceae) and in *Sarcostemma* (Asclepiadaceae) and leaf succulence in Aizoaceae, Chenopodiaceae, Crassulaceae, Portulacaceae and Zygophyllaceae.

In contrast, sclerophylly is widely developed throughout the area. It has origins dating back to the early Tertiary (Barlow 1981). Leaf xeromorphy in plants on gypsum in North America was studied and published in Shields (1951).

Neither succulence nor sclerophylly seem noticeably developed on any of the gypsum sites visited.

APPENDIX.

Plant collections and literature records signifying definite or likely gypseous occurrence of plant species

Herbarium specimens cited, by collector and their unique collection number, are from South Australia unless otherwise stated

Aizoaceae

Carpobrotus modestus, on deep floury gypsum at Kopi: Symon 16403.

C. rossii, on deep gypsum at Lake Macdonnell (Symon 16356) and Marion Lake (Symon 16582).

Disphyma crassifolium subsp. *clavellatum*, at Lake Gillies (Symon 16003), Streaky Bay (Symon 16431), Lake Macdonnell (Symon 16381), Lake Fowler (Symon 16665).

Gunnliopsis is widespread through southern drier areas. This genus has species tolerant of gypsum but no true obligate gypsophiles.

G. kockii, some likely sites but none mention gypsum.

G. papillata, with many collections, Bates 18814, Ising 1955, Robinson 2706, Symon 9114, 9345, collected on gypsum.

G. quadrifida, many collections with Canty 2340 and Crocker 41 on gypsum.

G. rubra, recorded on gypsum in W.Aust. by Matiske (1995).

G. septifraga, many collections, including Bates 23615

and Symon 12347 on gypsum and some likely sites.

G. tenuifolia, many collections and likely sites; only Bates 17309 mentions gypsum.

G. zygophylloides, many collections. Murfet 721 records gypsum.

Tetragona implexicoma, on deep gypsum at Lake Macdonnell (Symon 16344) and Lake Fowler (Symon 16641).

Amaranthaceae

Amaranthus mitchellii, many collections, but few record gypsum: Symon 15659, Bates 50534.

Hemichroa diandra, recorded on gypsum in W. Aust. by Matiske (1995), in S. Aust. on gypsum by DEH 430-589.

Ptilotus is a large genus with many species and few records of tolerance.

P. barkeri, Bates 18781 & 19795 record gypsum, while 5 others are from likely sites.

P. nobilis, many collections and some likely sites but only Symon 15700 records gypsum.

P. parvifolius, includes some likely sites in S. Aust. but only Nordenstam & Anderberg 961 record gypsum.

Apocynaceae

Alyxia buxifolia, Cleland AD97213128, Symon 16562, 17272.

Boraginaceae

Embadium johnstonii, a small rare annual, there are likely sites and Bates 50579, 59367, Davies 693, 694, 695, 696 all record gypsum.

Heliotropium curassavicum; there are many collections at AD mostly from fresh or saline muds with few likely sites. Only Conrick 1790 and Latz 14070 from N.T. mention gypsum.

Omphalolappula concava, recorded on gypsum in W. Aust. Matiske (1995).

Campanulaceae

Isotoma scapigera, recorded on likely sites in southern Yorke Peninsula by Green (1993) and on gypsum by Symon 16359, 16589, 16606, 16689.

Casuarinaceae

Casuarina obsea, reported on gypsum in W. Aust. (Short 2000).

C. pauper, DEH BS94-4292 on gypsum.

Chenopodiaceae

This large family is particularly well developed in the drier areas of southern Australia. Species occur on almost all land forms and are frequently found on saline areas.

Atriplex vesicaria, recorded on gypsum in W. Aust. by Matiske (1995), in S. Aust. by Symon 15989, 19994, 16022, 16271, DEH 430-585, and in N.T. by Chippendale 6397.

Atriplex holocarpa, seasonally abundant on gypseous soils of the Moon Plain, north of Coober Pedy: Bates 59335, 59346.

Atriplex spongiosa, seasonally abundant on gypseous soils on the Moon Plain, north of Coober Pedy: Bates 59266, 59273, 59336, 59348, 59237.

Atriplex stipitata, Symon 16721.

Enchylaena tomentosa, an extremely widely spread shrublet by no means confined to gypsum, Symon 16404, 16535, 16719.

Einadia nutans, also a widely spread shrublet with very few records on gypsum, Latz 15464 in N.T.

Halosarcia calyptrata, Chippendale 6377 on gypsum in N.T.

H. halocnemoides, Latz 15562 in N.T. on gypsum.
H. pruinosa, Chippendale 6376 in N.T. on gypsum.
Maireana, like *Atriplex*, a large genus with many species from many sites.
M. appressa, Symon 9347 in S. Aust., Latz 14068, in N.T. on gypsum
M. erioclada, widespread but also found on gypsum Symon 16307, 16354, 16444.
M. luehmannii, Chippendale 6378 in N.T. on gypsum
M. oppositifolia, recorded on gypsum W. Aust. by Mattiske (1995) and in S. Aust. by Symon 16019, 16286, 16331, 16430.
M. pentatropis, on kopi at Kopi, Symon 16412.
M. schistocarpa, Latz 15925 in N.T. on gypsum
M. trichoptera, Symon 16530 on gypsum.
Malacocera gracilis There is a high proportion of gypsum records in the relatively few specimens at AD: Bates 28603, Briggs 535, 1415, Chinnock 1695, 2105, 4326, 16905.
Monolepis spathulata, recorded in millions on the Moon Plain, Bates 59253, indicating a likely species.
Osteocarpum pentapterum, Henshall 560 on gypsum in N.T.
O. saluginosum, only Latz 15582 in N.T. on gypsum.
Rhagodia crassifolium, recorded on gypsum in W. Aust. by Mattiske (1995), and in S. Aust. by Symon 15981, 15992, 16409, 16439, 16572, 16632.
R. preissii, Symon 16278 on gypsum.
R. spinescens, Symon 15982 on gypsum.
Scleroblitum atriplicifolium, this species is frequently found on likely sites but few record gypsum: Davies 715.
Sclerolaena. A large genus of over 60 species widely spread throughout drier Australia but excluding Tasmania. Many species come from saline areas including likely sites. All the following record gypsum.
S. blackiana, Davies 701, Bates 59500.
S. brevifolia, Symon 15987, 16396, 16538.
S. clelandii, Bates 46969, Symon 12553, 12599 in S. Aust., Albrecht 7185, 7192 in N.T.
S. constricta, Bates 17285, 51029, Lothian 2087, Smyth 260, Symon 13205.
S. decurrens, Robinson 846 in S. Aust., Latz 15591 in N.T.
S. deserticola, Bates 14720, Symon 12548, 12607.
S. diacantha (see also *S. uniflora* with which it may be confused), Symon 15993, 16273, 16279, 16306 in S. Aust., Latz 15848 in N.T.
S. fimbriolata, Symon 9935.
S. intricata, Latz 15351 in N.T.
S. parviflora, Latz 15746 in N.T.
S. symoniana, likely sites and Symon 12531, 12594, DEH 430-59a.
S. tatei, Badman 4286, Bates 19248, Barker 232.
S. uniflora, Symon 16402, 16414.
Sclerostegia moniliformis, recorded on gypsum in W. Aust. by Mattiske (1995).
S. tenuis, Albrecht 7173 in N.T., on gypsum.
Threlkeldia diffusa, a widely distributed undershrub but common on gypsum: Symon 15986, 16021, 16413, 16618, 16644.

Compositae

This very large family includes species found in almost any habitable environment. With the Chenopodiaceae it includes a large number of gypsum tolerant species as well as some true gypsophiles.
Angianthus preissianus, often on sub-saline area; two collections on gypsum: Symon 16587, 16625.
A. uniflora, Short 4220 on gypsum in W. Aust.
Asteridea archeri, reported by Short (2000) on gypsum

mound in W. Aust.
A. chaetopoda is recorded on gypsum in W. Aust. by Mattiske (1995) and Short (2000).
Brachyscome ciliaris, a widespread species with several varieties and numerous collections.
—var. *ciliaris* was recorded on gypsum in W. Aust. by Mattiske (1995) and in S. Aust. by Symon 16516, 16702.
—var. *lanuginosa*, also widespread and has been recorded on gypsum in S. Aust. by Symon 15698, 16195 and in N.T. by Latz 15847.
B. eriogona, a single record: Bates 51032.
Calocephalus sonderi, a single collection on deep gypsum, Lake Macdonnell: Symon 16369.
Calotis hispidula, widespread small herbs and many collections with few likely sites: Symon 16198, 16524.
Centipeda thespidiodes, in N.T.: Latz 15890.
Chondropycis halophila: there are few collections at AD with some likely sites. Kuchel 1566, Symon 16380 record gypsum.
Eclipta alatocarpa, a rare plant in S. Aust. with few collections at AD with some likely sites. Symon 15668 records gypsum.
Erymophyllum glossanthus is recorded on gypsum in W. Aust. by Mattiske (1995).
Flaveria australasica, Symon 16573 records gypsum. This genus has been recorded as gypsophilous in Mexico (Johnson 1941).
Gnephosis drummondii, recorded on gypsum in W. Aust. by Mattiske (1995).
Haegiela tatei, recorded on gypsum in W. Aust. by Mattiske (1995).
Helichrysum leucopsidium, collected on deep gypsum at Lake Macdonnell: Symon 16339.
Kippistia suaedifolia, a true gypsophile, with virtually all collections found on gypsum even on relatively isolated sites as at Lake Fowler. In S. Aust. Badman 3794, Bates 28587, Crocker s.n. Keane s.n. Knight 135, Kuchel 1563, Lay 513, Purdie 2846, Reid 174, Symon 3758, 12375, 12587, 14511, 15240, 16352, Woolmer 3, all record gypsum. In W. Aust. Eichler 21259, Short 4221, in N.T. Latz 15680, 14075, in N.S.W. Pickard 2872, 2975, in Vict. Corrick 7418 record gypsum. In addition there are many likely sites amongst the collections. See Lander (1980a) for a recent account.
Leiocarpa tomentosa, Latz 15588 in N.T.
Microseris lanceolata, there are many collections at AD and few come from likely sites, Symon 16023 was collected in gypsum flour at Cooke Plains.
Millotia major, recorded on gypsum in W. Aust. by Mattiske (1995) and in S. Aust. in Symon 16591A.
Minuria annua, occurs on likely sites. Bates 50346, 59250, Symon 9118, 9288 record gypsum. See Lander (1980b) for a recent account.
M. cunninghamii, in N.T., Latz 15929.
Minuria gardneri, all the few collections record gypsum: Symon 16011 from S. Aust., Eichler 21261, Lander s.n., Short 4222 from W. Aust.
Minuria multiseta, a probable gypsophile; Donner 7407, Symon 12557, Williams 9573, 10557, 10694 in S. Aust., Albrecht 8805, Latz 4113, 5724 in N.T.: all record gypsum.
Olearia axillaris, in deep gypsum: Symon 16341 and 16599.
Pleuropappus phyllocalymmeus, Bates 59852, and likely sites particularly in southern Yorke Peninsula.
Podotheca angustifolia, on gypsum: Symon 16574.
Pogonolepis muelleriana. Many collections and some likely sites. Bates 51265, Robinson 3409, Spooner 12301, Symon 16295, 16498 record gypsum.
Pseudognaphalium luteoalbum, many collections but only

- a single record, *Symon 16605*, on gypsum.
Pycnosorus pleiocephalus, *DEH 430-587*.
Senecio lanibracteatus, I. Thomps., many collections, a single record on gypsum: *Symon 16204*.
Senecio gypsicola, this relatively newly described species is confined to gypseous sites in the Coober Pedy–Oodnadatta–Arckaringa triangle. All collections record gypsum: *Bates 19816*, *Symon 15664*, *15699*, *16161*, *16196*. It is surprising that this relatively distinctive annual was not collected by Ising despite his many collections in that area. This probably reflects the intermittent occurrence of short lived species in this arid area (cf. *Nicotiana truncata*).
Senecio spanomerus, *Symon 15990*, *16362*, *16580*, *16648*, all on gypsum.
Sonchus oleraceus, extremely widespread herb, on deep gypsum (*Symon 16197*, *16366*, *16551*, *16647*, *16704*).
Streptoglossa adscendens, many collections; few likely sites only, e.g. *Bates 51080*.
Trichanthodium skirrophorum, many collections; few likely sites only, e.g. *Bates 51022*.
Vittadinia australasica, *Symon 16550*, *16705* on gypsum.
V. eremaea, *Latz 15542*, *15580* from N.T., on gypsum.
V. gracilis, *Symon 16528*, *16708* on gypsum.

Convolvulaceae

- Convolvulus recurvatus*, common on deeply cracking gypseous soils, e.g. *Bates 59520*, *Symon 16203*, *15680*, on the Moon Plain, north of Coober Pedy.
Wilsonia backhousei, collected on gypsum at Marion Lake, *Symon 16622*.

Cruciferae

- A large family with many mainly annual species in arid Australia.
Arabidella nasturtium, some likely sites. *Bates 59225*, *59263*, *Symon 9113* record gypsum.
A. glaucescens, many likely sites. *Badman 1026*, *Davies 711*, *Lothian 2077* all record gypsum.
Arabidella procumbens, in thousands on gypsum (*Bates 59233*).
Carinavalva glauca, an uncommon plant and comes from likely sites but no record of gypsum.
Lepidium stronglyllopyllum, an uncommon plant and comes from likely sites but no record of gypsum.
Lepidium phlebopetalum, a widespread herb. *Davies 706*, *714*, *Smyth 254* record gypsum.
Lepidium sagittulatum, seasonal on gypseous washes of the Moon Plain, north of Coober Pedy (*Bates 59234*).
Menkea australis, a single record *Bates 59284* on gypsum.
Phlegmatospermum cochlearinum, a widespread species; *Bates 59265*, *Davies 710*, *Symon 15666*, *16185* record gypsum.
Stenopetalum decipiens, recorded on gypsum in N.T. by *Latz 15452*, *15585*.

Droseraceae

- Drosera macrantha*, recorded on gypsum in W. Aust. by *Mattiske (1995)*.

Dysphaniaceae

- Dysphania.** The several species of small herbs are frequently collected on gypseous sites. All species and collections listed are recorded gypsum.
D. kalpari, *Michael 328*.
D. plantaginella, *Badman 473*, *752*, *Bates 17369*, *Crisp 827*.
D. platycarpa, *Latz 14158*, *46908*, in N.T.
D. simulans, numerous records: *Badman 813*, *Bates 28579*, *Robinson 2707*, *Smyth 255*, *Symon 12346*, *14510*,

Williams 7487 in S. Aust., *Albrecht 7191*, *Henshall 2117*, *Latz 04057*, *14162*, *14073* in N.T., *Symon 9941* in W. Aust.

- D. sphaerosperma*, *Albrecht 7188*, *8797*, *Henshall 728*, *7800*, *Richardson 8*, *Latz 15446* in N.T.

Epacridaceae

- Acrotriche patula*, on deep gypsum at Lake Macdonnell (*Symon 16365*) and at Marion Lake (*Symon 16560*).
Constephium drummondii, recorded on gypsum in W. Aust. by *Mattiske (1995)*.
Leucopogon aff. *insularis*, recorded on gypsum in W. Aust. by *Mattiske (1995)*.
Leucopogon parviflorus, *Symon 16585* on gypsum.
Styphelia hainesii, reported on gypsum in W. Aust. (*Short 2000*).

Euphorbiaceae

- A large cosmopolitan family from many habitats. Species are known from the gypsophilous flora of Mexico (*Johnston (1941, Waterfall 1946)*).
Euphorbia australis, widespread mostly on stoney slopes. Only *Symon 15253* and *Vonow 2345* record gypsum.

Frankeniaceae

- Frankenia** is a large and difficult genus that is common on many saline sites. Discrimination between saline and gypseous is often inadequate.
F. cinerea/punctata was recorded on gypsum in W. Aust. by *Mattiske (1995)* and in N.T. *Chippendale 6382*.
Frankenia cordata, *Chippendale 6396* on gypsum in N.T.
F. foliosa, *Bates 46968* on gypsum.
F. sessilis, *Symon 16346*, *16374*, *16469*, *16679*, on deep gypsum.
F. pauciflora, *Symon 16440*, on gypseous sand.

Geraniaceae

- Erodium carolinianum*, *Symon 15244* on gypsum.

Goodeniaceae

- This widespread and substantially Australian family is dominated by two genera *Goodenia* and *Scaevola* both of which contain tolerant species and one gypsophile.
Goodenia anfracta, a rare species cryptically coloured. Of the few collections at AD, *Symon 9349*, *13188*, *13206A*, *14512* all record gypsum.
G. fascicularis, a widespread herbaceous perennial from many sites. A woolly or cottony form has been repeatedly collected from the Moon Plain area: *Bates 51029*, *Symon 15663*, *15677*, *15688*, *16207*, indicating a likely gypseous species.
G. gypsicola, *Alcock 8289*, *Symon 12605*, *White AD99931164* in S. Aust., *Chinnock 8586*, *Leeuwen 3006*, *Nicoll 2660*, *2671* in W. Aust., all collections come from gypseous sites. This species is probably a true gypsophile.
G. lobata, a rare species with few collections at AD; *Bates 50919* reports gypsum.
G. pusilliflora, a widespread ephemeral with few likely sites; only *Bates 28632* reports gypsum.
G. varia, a widely spread sub-coastal species common on gypsum: *Symon 16355*, *16586*.
Scaevola, a widely distributed genus of at least 70 species in Australia.
S. collaris, a small shrub common on saline and subsaline sites. Many collections at AD of which *Symon 12544*, *12590*, *13189* in S. Aust., *Albrecht 7174*, *Latz 15583* in N.T. all record gypsum; also recorded on gypsum in W. Aust. by *Mattiske (1995)*.
S. crassifolia, collected on deep gypsum by *Symon 16349*, *16603*.

- S. parvibarbata*, a widespread small shrub with few likely sites. Bates 50919, 50984 in S. Aust., Latz 14060 in N.T. record gypsum.
- S. spinescens*, a tough, long-lived, intricate shrub; only Chippendale 6380 in N.T. mentions gypsum.

Gramineae

This large family occurs in almost all ecological sites. A large number of species are tolerant of some gypsum and it is possible that some *Austrostipa* are true gypsophiles.

- Austrostipa drummondii*, recorded on gypsum in W. Aust. by Mattiske (1995) and in S. Aust. Symon 16645, 16678.
- A. elegantissima*, a widespread species with a single record Symon 16642.
- A. exilis*, several records Symon 9550, 15845, 16592, 16635.
- A. flavescens*, a single record Symon 16688.
- A. geoffreyi*, the type Jacobs 7030 was described from gypsaceous islands at Lake King, W. Aust.
- A. nitida*, several records Crocker s.n. Camp 44-45, DEH 430-588; Latz 15548 in N.T.
- A. nodosa*, Symon 16710 on gypsum.
- A. nulla-nulla*, a relatively uncommon species. The type description states "apparently restricted to gypsaceous rises". All our few collections record gypsum: Bates 20758, Brown 402, 408, Symon 3728, 16649, 16670, 16677, DEH 430-583. This species may be a true gypsophile.
- A. puberula*, a single record Symon 16532 on gypsum.
- A. scabra* ssp. *falcata*, a widespread species and subspecies, with Symon 15845, 16716 recording gypsum.
- A. stipoides*, a coastal species with a single record Symon 16584 on gypsum.
- A. trichophylla*, a widespread species, with only Bates 17053, Symon 16532, 16717 recording gypsum.
- A. vickeryana*, a rare species in S. Aust. Only Barratt s.n. records gypsum.
- Cynodon dactylon*, a single record on gypsum: Latz 15538 in N.T.
- Dactyloctenium radulans*, widespread with numerous collections; a single record on gypsum: Symon 16194.
- Danthonia caespitosa*, very widely spread, but only three good records Symon 16533, 16553, 16701 on gypsum.
- Enneapogon**. This genus is related to *Pappophorum* which includes gypsophilous species in southern U.S.A.
- E. cylindricus*, although mostly found on calcareous sites, Symon 15249 and Vonow 234 record gypsum.
- Eragrostis**, a large and varied genus with many collections.
- E. dielsii*, with numerous collections and some likely sites; Bates 59289, Symon 16183, 16184 in S. Aust., Latz 15579 in N.T. record gypsum.
- E. falcata*, numerous collections and likely sites; Bates 9567, Robinson 805, Symon 12534, 13135, 13190, record gypsum.
- E. pergracilis*, has been collected from a number of likely sites and Symon 12582, 12583, 14372 record gypsum.
- Eriachne helmsii*, a single record Latz 15539 in N.T. on gypsum.
- Eriochloa australiensis*, a single record Symon 16199 on gypsum.
- Panicum laevinode*, commonly found on the deep cracking clays in the gibber plain washes and certainly in a number of likely sites. Badman 5132, Bates 50576, 50577, Martin AD99226012, AD99226018; Symon 16191, 16200 record gypsum.
- Polyopogon tenellus*, Bates 26048 on gypsum.
- Setaria basiclada*, a single record Albrecht 7187 in N.T.

on gypsum.

- Triodia pungens*, a single record Latz 15549 in N.T. on gypsum.

Haloragaceae

- Haloragis aspera*, frequently found on the gypsum-influenced soils of the washes and creeklines in the Moon Plain area north of Coober Pedy, Symon 16193.
- H. odontocarpa*, a single record, Bates 59513, from likely sites in the same area as above.

Juncaginaceae

Plants of aquatic, marshy or seasonally wet sites. The small annual species include some that are tolerant of gypseous soils.

- Triglochin centrocarpum*, Bates 59708, 59812 on gypsum
- T. mucronatum*, Bates 59810 on gypsum.
- T. trichophorum*, Bates 59777, 59822 on gypsum.

Labiatae

Teucrium racemosum. This perennial rhizomatous herb occurs on the deep cracking soils of low lying seasonally wet areas; some of these are strongly influenced by gypsum as on the Moon Plain, north of Coober Pedy. Bates 51096, Symon 15676, 16188, 16529 suggest gypsum.

Leguminosae

Acacia is a huge genus of about 1000 species in Australia, they occur in nearly all habitats and, although a number of species have been collected on gypsum, there is no suggestion that any of them are true gypsophiles.

- A. aneura* var. *conifera*, recorded on gypsum by Latz 15584.
- A. anceps*, on deep gypsum: Symon 16334.
- A. argyrophylla*, on deep gypsum: Symon 16657.
- A. calcicola*, recorded on gypsum: Cleland AD95802150.
- A. cibaria*, recorded by Latz 15537 in N.T. on gypsum.
- A. cupularis*, on gypsum: Symon 16659.
- A. kempeana*, Chippendale 6388 in N.T. records gypsum.
- A. longifolia*, on gypsum: Symon 16602.
- A. nematophylla*, on gypsum: Symon 16555.
- A. prairiini*, on gypsum Symon 12571.
- A. tetragonophylla*, recorded by Chippendale 6387 and Latz 15447 in N.T. on gypsum.
- A. victoriae*, recorded by Latz 15543 in N.T. on gypsum.
- Cullen australasicum*, Latz 14153 in N.T. on gypsum.
- Eutaxia microphylla*, Symon 17274, on deep gypsum.
- Swainsona** is a genus of 80–90 species widespread in arid Australia and absent from the monsoonal and tropical north.
- S. campylantha*: amongst the numerous collections at AD only Bates 51030 and Symon 16205 record gypsum.
- S. cyclocarpa*, few collections at AD but Latz 15561 in N.T. is from a likely site.
- S. fuscoviridis*: Bates 50042 describes this as 'Salt Lake Swainsona' and records it on gypsum at the edge of Lake Harris, Eyre Peninsula.
- S. microphylla*: no gypsum recorded on the numerous collections at AD. However, Albrecht & Latz 8806 record it on gypsum in the N.T.
- S. minutiflora*, a rare and small *Swainsona* responding to rains. Bates 59268 records thousands of small plants on gypsum.
- S. purpurea*, widespread with numerous collections at AD. There are some likely sites: Bates 59269, and Symon 12591, 16202 report gypsum.
- S. unifoliata*, few collections at AD, Albrecht 7193, Latz 15678, Maconochie 8808 in N.T. and Symon 12439, 12762 in S.Aust. record gypsum.

Trigonella suavisissima Lindl, an abundant and widespread herb with many collections at AD. Only Latz 14162 in N.T., Symon 15247, 16189 in S. Aust. record gypsum. *Templetonia retusa*, in deep gypsum at two sites: Symon 16350, 16558.

Lythraceae

Lythrum wilsonii, Latz 14163 in N.T. on gypsum.

Malvaceae

Hibiscus trionum: only Symon 15674, 15683 record gypsum.

Lawrenzia, a small genus of a dozen species frequently found in depressions with heavy soils, often subsaline and some with gypseous derivations.

L. glomerata, gypsum occurs repeatedly in the substrate of this species, but many collections come from sites with no indication of gypsum. However, Badman 3795, Bates 19321, Purdie 2798, Symon 12379, 12537, 12584, 16323, 16336, 16621 in S. Aust., Chippendale 6375, Latz 15564, 15681 in N.T., in W. Aust. (Short 2000), all record gypsum. Several species occur in this complex, varying in their soil preferences, only some gypseous (W. Barker pers.comm., September 2006).

L. helmsii, a striking plant not common. As virtually all collections available to me mention gypsum, it may be a true gypsophile: Conrick 933, Melville 4011, Symon 5460, all in W. Aust.

L. squamata, a widespread shrub, mostly found on heavy subsaline soils; the following record gypsum: Lander 1165, Latz 5946, Smith 790 in W. Aust.; Latz 15563 in N.T.; Canty 2356, Bates 19826, 19915, Latz 15846, Mollemans 1784, Purdie 2782, 2848, Symon 15563, 16006, 16335, 16337, 16433, 16612, Vonow 2178, Williams 7488 in S. Aust.

L. viridi-grisea, Latz 18067 in N.T. and likely sites.

Sida is a large and widespread genus with few records of tolerance to gypsum.

S. ammophila, Latz 15811 in N.T. on gypsum.

S. everistiana, Latz 14055 in N.T. on gypsum.

S. intricate, Latz 15850 in N.T. on gypsum.

Myoporaceae

Eremophila glabra ssp. *glabra*, Maconochie 1807 in N.T. on gypsum.

E. neglecta, Henshall 3293 in S. Aust., on gypsum.

Myrtaceae

A large family that may dominate the botanical landscape in Australia. *Eucalyptus* is a very large genus and is widely distributed, *Melaleuca* is smaller but equally widespread. Both contain tolerant and possible gypsophile species.

Calytrix gypsophila, has been collected from many likely sites and is probably a true gypsophile. All the following record gypsum: Bates 20768, Lay 89, 199, Mollemans 670, 706, 756, 1750, 18877-1880 inc, Symon 12535, 14751, DEH 430-586.

Calytrix tetragona Labill, on deep gypsum: Symon 16347, 16554.

Darwinia salina, one of the many species in which the distinction between salt and gypsum tolerance is not clear. Many collections are from saline sites, but Bates 3292, Croft 11, Symon 16000 all record gypsum.

Eucalyptus. A very large genus with over 500 species in Australia found in almost all habitats. A number of species are tolerant of gypsum and there may be a single gypsophile.

E. 'anceps' was recorded on gypsum in W.Aust. by Mattiske (1995).

E. brachycalyx, on deep gypsum Symon 15997, 16016, 16287.

E. diversifolia, mostly on limestone but Symon 16616 on deep gypsum.

E. eremicola, mostly on sand but Forde 482 in N.T. records gypsum

E. gracilis, a widely dispersed species; it has been collected on deep gypsum, e.g. Symon 15979, 16015, 16633.

E. gypsophila, named because of its common occurrence on gypseous dunes around salt lakes. Of the many collections at AD and despite many likely sites, only the following mention gypsum: Lay 525, Mollemans 809, 869.

E. intertexta, a widely distributed species with some disjunct populations. Latz 15436 in N.T. records gypsum.

E. leptophylla, widespread across southern Australia, but only Symon 16293 records gypsum.

E. mannensis, mostly growing on sand, but Forde 122, Latz 15463 in N.T., DEH BS94-4296 in S. Aust. record gypsum.

E. oleosa, a widespread and variable species mostly on limestone, but only Symon 16539 records gypsum.

E. oxymitra, mostly on dunes and sand plains; only Latz 15453 in N.T. records gypsum.

E. quadrans, recorded on gypsum in W. Aust. by Mattiske (1995).

E. socialis, like *E. oleosa*, a widely spread species on a variety of soils. Only Hill & Stanberg 3198, Symon 15980, 16540 record gypsum.

Leptospermum. Most species grow in moderate to high rainfall areas. Few extend to the drier areas.

L. coriaceum, the only relevant record is on gypseous sand: Symon 16267.

Melaleuca. A large genus extending throughout Australia. Several species certainly tolerant of gypsum and one possible gypsophile.

M. gibbosa, mostly found in sub-swampy sites, with only Symon 16611 on deep gypsum.

M. halmaturorum, a species found in swamps and depressions, often saline, but has been collected from gypseous sands by Symon 16304, 16315, 16443, 16556.

M. hamulosa, recorded on gypsum in Western Australia by Mattiske (1995).

M. lanceolata, widely distributed often on limestone, but noted on deep gypsum by Symon 16634.

M. nanophylla, found on some likely sites. Cornwall 463, Forde 480 record gypsum.

M. pauperiflora, usually found about seasonal swamps and depressions with fresh rather than salt water. AD collections contain no mention of gypsum except Symon 15988, 16393 on deep gypsum dune and Symon 16305 on deep kopi flour.

Orchidaceae

Microtis unifolia, collected on deep gypsum by Symon 16576.

Thelymitra macrophylla, recorded on gypsum in W. Aust. by Mattiske (1995).

Pittosporaceae

Billardiera cymosa, collected on deep gypsum: Symon 16332.

B. lehmanniana, recorded on gypsum in W. Aust. by Mattiske (1995).

Plantaginaceae

Plantago cunninghamii, two records, "in millions" Bates 59226, 59262 on gypsum.

Polygalaceae

Comesperma volubile, common on deep gypsum: *Symon* 16330.

C. viscidulum, a rare plant in S. Aust., collected on gypsum: *Symon* 14759.

Potamogetonaceae

Ruppia maritima, Latz 14087 in N.T., in gypseous water.

Proteaceae

Hakea francisiana, Lay 85, the only species of this large family recorded on gypsum so far.

Santalaceae

Exocarpos aphyllus, *Symon* 17273, in likely sites.

Santalum spicatum, Latz 15545 in N.T.: two trees on edge of gypsum depression.

Solanaceae

Duboisia hopwoodii, recorded on gypsum by Latz 15468 in N.T.

Lycium australe, this shrub has been collected on deep gypsum several times, e.g. *Symon* 15984, 16457, 17270.

Nicotiana. A medium-sized genus distributed over much of Australia but is less common in the high rainfall and tropical regions. Only few species have reliable records on gypsum.

N. burbridgeae, not common, in the general area of Dalhousie Springs. A number of likely sites. *Robinson* 2708 and *Symon* 9294, 14456 record gypsum.

N. occidentalis subsp. *obliqua*, *Albrecht* 8809 in N.T., on gypsum.

N. truncata, a recently described species confined to the Coober Pedy – Oodnadatta area, particularly in shallow washes on soils strongly influenced by gypsum. It may be a true gypsophile. *Symon* 15665, 15671, 16208, 16233 all record gypsum.

N. velutina, a widespread species; it was reliably collected on gypsum in the far north west of S. Aust. by *Symon* 12332, 12560, 12570.

Solanum. This huge genus with almost 100 species in Australia is found in almost all sites except alpine and aquatic areas. Several species are gypsum-tolerant and one is a possible gypsophile. All the following are from S. Aust.

S. coactiliferum, a widespread species with a single record on gypsum: *Symon* 16002.

S. esuriale, a similarly widespread species with a single record on gypsum: *Symon* 15672.

S. hystrix, with a single record on deep gypsum: *Symon* 16363.

S. lacunarium, several records from the gypseous soils: *Symon* 15669, 16186.

S. oligacanthum, several records from the gypseous soils: *Symon* 15658, 15694.

S. symonii, found on likely sites and on gypsum (*Burford* 96, *Kuchel* 1565), on crystalline gypsum (*Symon* 9548), and on deep gypsum (*Symon* 16367, 16597).

Umbelliferae

Daucus glochidiatus is a widespread variable annual with many collections and some likely sites: *Bates* 51267, 59251, *Symon* 15691, 16031, 16034, 16548, 16573, from N.T. Latz 15387, all mention gypsum.

Hydrocotyle, a large genus of small plants, a number growing in wet, saline or gypseous sites.

H. hexaptera is recorded on gypsum in W. Aust. by *Mattiske* (1995).

H. medicaginoides: this small herb is often found in saline areas and some likely sites. It is one of those plants that occur in leaf litter and thin loams covering gypsum and the extent to which its roots penetrate gypsum may at times be debatable. The following mention gypsum: *Bates* 51268, 59827, *Kuchel* 1567, *Symon* 16031, 16035, 16361, 16457, 16623.

Trachymene cyanopetala, once collected on gypseous sand: *Symon* 16291.

Trachymene glaucifolia, mostly found on sand or in rocks but there are some likely sites in addition to *Bates* 51026 and *Symon* 15667, 15689 that record gypsum.

Trachymene ornata, one record on gypsum: *Symon* 16266.

Trachymene pilosa, two records on gypsum: *Symon* 16294, 16570.

Zygophyllaceae

Nitraria billardieri, a widespread shrub often found in sub-saline areas. It has been repeatedly collected on gypsum and is obviously tolerant. The following are all from deep gypsum: *Symon* 16333, 15995-6, 16536, 16601.

Zygophyllum. This genus is well developed in the drier areas. Many species are tolerant of both alkaline, saline and gypseous soils and are repeatedly collected on gypsum.

Z. aurantiacum subsp. *aurantiacum*. In S. Aust. *Purdie* 1119 records gypsum, while the following record deep gypsum: *Symon* 15983, 16393, 16537, 16638, 16700, *DEH* 430-584. Recorded on gypsum in W. Aust. by *Mattiske* (1995) and in N.T. by *Albrecht* 7189, 8807 and *Richardson* 9.

Z. aurantiacum subsp. *simplicifolium*, on deep gypsum: *Symon* 16351, 16377, 16411.

Z. ammophilum, *Symon* 16296 on gypsum.

Z. billardieri, *Symon* 16445 on gypsum.

Z. compressum, Latz 14098 in N.T., *Bates* 9563, 28586, 32314, *Chinnock* 2102, *Symon* 16338, *DEH* BS94-4405 in S. Aust. all record gypsum.

Z. crassissimum, *Albrecht* 7190 in N.T., and *Bates* 19924, 51040 in S. Aust. report gypsum.

Z. hybridum, *Bates* 50483 reports gypsum.

Z. humillimum, *Bates* 50399, 59223 reports gypsum.

Z. ovatum, on deep gypsum *Symon* 15991.

Z. kochii, the collections *Bates* 59224, 59362 record gypsum.

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Re-instatement of the name *Spyridium waterhousei* from Kangaroo Island, South Australia, with a short history of the tribe Pomaderreae (Rhamnaceae)

Jürgen Kellermann

National Herbarium of Victoria, Royal Botanic Gardens Melbourne,
Birdwood Avenue, South Yarra, Victoria 3141
School of Botany, The University of Melbourne, Victoria 3010
Email: Juergen.Kellermann@rbg.vic.gov.au

Abstract

The name *Spyridium waterhousei* F.Muell. is re-instated for a species of Rhamnaceae (Pomaderreae), endemic to Kangaroo Island, South Australia, that is currently known as *Cryptandra waterhousei* (F.Muell.) F.Muell. The taxonomic history of the species and of the tribe Pomaderreae is explored and the changing generic concepts are reviewed in the light of recent publications. A lectotype is nominated for the species. It was named after Frederick G. Waterhouse, who was one of the first botanical collectors on the island.

Introduction

“[M]ost of the genera [of Australian Rhamnaceae], even the most natural ones, are difficult to characterize. The differences in their flowers and fruits are very trifling; they often pass into each other by the finest gradations, and habit, foliage, and inflorescence must often be relied upon for fixing generic limits.”

George Bentham, *Flora Australiensis* 1: 410

Waterhouse and Kangaroo Island botany

Frederick George Waterhouse (1815–1898) was curator of the South Australian Institute Museum from 1860–1882 (Kraehenbuehl 1976). Early in 1861, he was sent on an expedition to Kangaroo Island by the South Australian Government, chiefly to collect zoological specimens, but he also gathered “as a result of byework about a hundred species of plants [...], which passed into the hands of Baron F. von Mueller” (Tate 1883, p. 133). His main collection grounds were along the Cygnet River near Kingscote in the northern part of the island. Mueller eagerly awaited the arrival of Waterhouse’s collections, as he mentions them in several of his reports and letters (e.g., Mueller 1861a, b, c). On 5 March 1861, George Francis, director of the Adelaide Botanic Gardens, sent “the entire collection of plants and seeds brought by Mr Waterhouse from Kangaroo Island” to Mueller (Best 1986, p. 116).

Mueller must have worked on the collection during 1861 and 1862, in preparation for the first volume of *Flora Australiensis* (Bentham 1863), as he described and published many species to make the names available for George Bentham. Waterhouse’s specimens added a substantial number of species to the flora list

of Kangaroo Island. Five taxa were new to science¹, and one of them, *Spyridium waterhousei*, was named by Mueller in honour of Frederick G. Waterhouse. The subsequent taxonomic history of the species reflects the confusion in the delimitation of the generic limits in Australian Rhamnaceae, in particular within the tribe Pomaderreae Reissek ex Endl.

The generic limits of Pomaderreae

Pomaderreae is the second largest tribe of Rhamnaceae and is endemic to Australia and New Zealand. It contains about 90% of Rhamnaceae species in Australia (c. 220–230 species) and currently consists of seven genera: *Blackallia* C.A.Gardner, *Cryptandra* Sm., *Pomaderris* Labill., *Siegfriedia* C.A.Gardner, *Spyridium* Fenzl, *Stenanthemum* Reissek, and *Trymalium* Fenzl. In Australia it is mainly distributed throughout the southern, temperate and semi-arid regions, but some species occur in the arid centre and the tropical North of the continent. Only *Pomaderris* extends to New Zealand with eight species that mainly occur on the North Island (Kellermann et al. 2005).

The generic history is summarised in Table 1 and Figure 1. In the 18th and 19th century, eleven genera were published in Pomaderreae, including the five main genera that are still accepted today (*Cryptandra*,

¹ *Bertya rotundifolia* F.Muell. (Euphorbiaceae), *Petrophile multisepta* F.Muell. (Proteaceae), *Pimelea ligustrina* var. *macrostegia* Benth. (= *Pimelea macrostegia* (Benth.) J.M. Black: Thymelaeaceae), *Spyridium nitidum* N.A.Wakef., and *S. waterhousei* F.Muell. (Rhamnaceae). Tate (1883, p. 133) mentions “five species new to science”. As *Spyridium nitidum* had not yet been described in 1883, Tate must have included *Spyridium leucophractum* (Schltdl.) F.Muell. in his count; this, however, was only a new combination. Wakefield (1957) used Waterhouse’s collection much later to describe *S. nitidum*.

Table 1. Genera of Pomaderreae and their taxonomic status, listed in order of publication. Currently accepted genera are indicated in bold type.

Year of publication	Genus	Type species	Species number/ Taxonomic status
1798	<i>Cryptandra</i> Sm.	<i>C. ericoides</i> Sm.	c. 55 species
1805	<i>Pomaderris</i> Labill.	<i>P. elliptica</i> Labill.	c. 75 species
1819	<i>Pomatoderris</i> Schultes	not designated	<i>nom. illeg. & superfl.</i> = <i>Pomaderris</i> Labill.
1824	<i>Pomatiderris</i> Kunth	not designated	<i>nom. illeg. & superfl.</i> = <i>Pomaderris</i> Labill.
1837	<i>Trymalium</i> Fenzl	<i>T. ledifolium</i> Fenzl	c. 13 species
1837	<i>Spyridium</i> Fenzl	<i>S. eriocephalum</i> Fenzl	c. 40–45 species
1838	<i>Ledelia</i> Raf.	<i>L. betulina</i> (Hook.) Raf.	= <i>Pomaderris</i> Labill.
1848	<i>Wichuraea</i> Nees ex Reissek	not designated	= <i>Cryptandra</i> Sm.
1858	<i>Stenanthemum</i> Reissek	<i>S. leucophractum</i> (Schltdl.) Reissek	c. 30 species
1858	<i>Stenodiscus</i> Reissek	<i>S. ulicinum</i> (Hook.) Reissek	= <i>Spyridium</i> Fenzl
1891	<i>Solenandra</i> Kuntze	not designated	<i>nom. illeg. non Hook.f.</i>
1934	<i>Siegfriedia</i> C.A.Gardner	<i>S. darwinoides</i> C.A.Gardner	1 species.
1942	<i>Blackallia</i> C.A.Gardner	not designated	2 species (currently under review, see Kellerman et al. 2005)

Pomaderris, *Spyridium*, *Stenanthemum*, *Trymalium*). The superfluous *Pomatoderris* was published presumably in an attempt by Schultes (in Roemer & Schultes 1817–1830) to correct Labillardière's spelling of the generic name *Pomaderris*. Possibly for the same reason, Kunth (1824) created the name *Pomatiderris*. *Ledelia* was created by Rafinesque (1838) for one species of *Pomaderris*, *P. betulina*. *Wichuraea* Nees ex Reissek and *Stenodiscus* Reissek were erected for species of *Cryptandra* and *Spyridium* respectively (Reissek 1848, 1858), and stem from an era in which the full extent of the variation within these genera was not yet fully understood. *Ledelia*, *Wichuraea* and *Stenodiscus* were not accepted by contemporary botanists of Rafinesque, Nees von Esenbeck and Reissek. In his quest to reform and standardise the 'Rules of Botanical Nomenclature', Kuntze (1891) published the superfluous *Solenandra* to replace *Stenanthemum*, since he was of the opinion that *Cryptandra* subgen. *Solenandra* Reissek should have retained its name when Reissek raised it to generic rank. By doing this, however, Kuntze created an illegitimate name due to the presence of an earlier homonym, *Solenandra* Hook.f. (Rubiaceae). Two genera were added to the tribe Pomaderreae in the first half of the 20th century by Gardner (1933; 1942) for Western Australian endemic species, *Siegfriedia* and *Blackallia*. The latter genus was not typified and recent analyses have shown that it consists of two unrelated species (Kellermann et al. 2005); a review of *Blackallia* is in progress. The analysis of Kellermann et al. (2005) also indicated that at least two new genera would be necessary to accommodate some unique species from Western Australia and Queensland. These will be published in the near future (Kellermann et al., in press & in prep.).

The first synopsis of Australian Rhamnaceae was published by Fenzl in 1837, in a five page long footnote in *Enumeratio plantarum [...] Hügel*. This was followed by a summary of Western Australian species by Reissek (1848) and a treatment of the family for *Plantae Muellerianae* (Reissek 1858). Both authors were experts of Rhamnaceae and defined some of the main genera of Pomaderreae (Fig. 1).

When writing the *Flora Tasmaniae*, Joseph Dalton Hooker "had great difficulty in disposing the species of the curious and difficult tribe of Australian *Rhamneae*" (Hooker 1855, p. 70) and limited the genera to *Pomaderris* (incl. *Trymalium*) and *Cryptandra* (incl. *Spyridium*). He later revised his view in the *Genera Plantarum* (Hooker 1862) and agreed with Bentham (1863) who accepted five genera: *Cryptandra*, *Pomaderris*, *Spyridium*, *Stenanthemum* and *Trymalium*.

Ferdinand von Mueller first accepted this view with the exception of *Stenanthemum* (Mueller 1862). "I was originally inclined to follow J. Hooker in admitting only *Pomaderris* & *Cryptandra* amongst the pomaderroid tribe", Mueller wrote to George Bentham on 24 Sep. 1862, continuing that he "finally adopted following your lucid remarks *Pomaderris*, *Trymalium*, *Spyridium* & *Cryptandra*; but I cannot go further & *Stenanthemum* must go into *Spyridium*" (Home et al. 2002, p. 159). In 1862, Mueller regarded *Spyridium* as belonging to a group, including *Cryptandra* and *Trymalium*, that was united by the presence of reniform to cordate anthers and hooded petals, in contrast to *Pomaderris* which had very oblong, versatile anthers and petals that were not hooded. Mueller's *Spyridium* also contained *Stenanthemum*, which only differed, in his opinion, in the presence of a "conspicuously cylindrical" calyx-

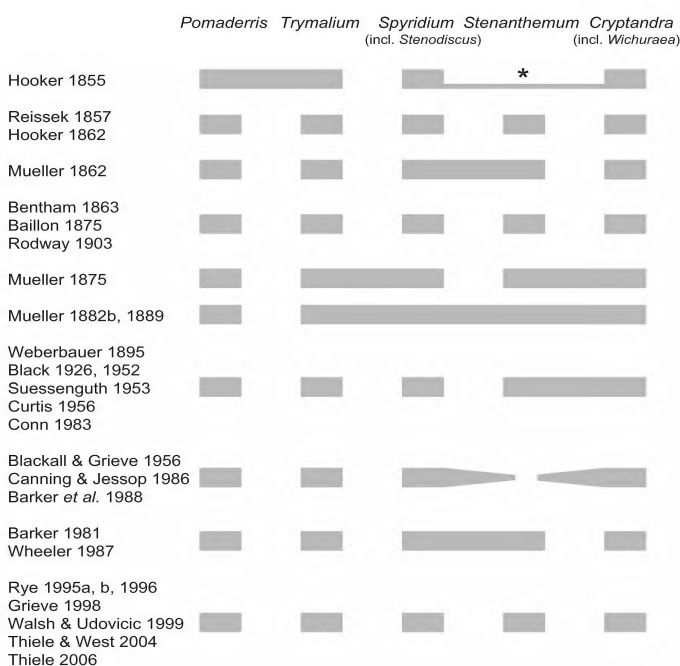


Fig. 1. Changing generic concepts in the main genera of Pomaderreae from 1855 to 2006. Only major floras and revisions are quoted. An asterisk indicates that *Stenanthemum* was not yet described in 1855.

tube. He did not realise the importance of dehiscent fruitlets and a different position of the disc in defining *Stenanthemum* (Thiele 2007). Mueller wrote: “Disci location et figura affirmationem generum Trymalii Spyridii et Cryptandrae parum adjuvat” (Mueller 1862, p. 85). This statement cannot be supported in the light of current research (Thiele & West 2004; Kellermann et al. 2005; Kellermann 2006; Thiele 2007).

Hooker (1862) and Bentham (1863) also divided the genera of Pomaderreae into two groups. The first was defined by a calyx-tube that was produced above the ovary and disc and it contained *Cryptandra* and *Stenanthemum*. The second group included genera with a calyx-tube that was absent or produced between the ovary and disc, namely *Pomaderris*, *Trymalium* and *Spyridium*. In 1875 Mueller seems to have adopted Bentham and Hooker’s view, since he stated: “Genera Trymalium, Spyridium, Stenanthemum et Cryptandra forsan e calycis forma melius disponenda” (Mueller 1875, p. 135). As such, he proposed to include *Trymalium* into *Spyridium*, and *Stenanthemum* into *Cryptandra*, with *Pomaderris* as a third genus. But he never went ahead with publishing the relevant new combinations.

Seven years later, Mueller reverted to his original view from 1862, recognising only *Pomaderris* and *Cryptandra*. This time, he made numerous

recombinations so as to include all species of *Trymalium*, *Spyridium*, *Stenanthemum* and *Cryptandra* in a greatly enlarged genus *Cryptandra* (Mueller 1882a, b; 1889, 1896). He defined *Cryptandra sens. lat.* as having anthers “almost broader than long”, a calyx tube “extended beyond the fruit” and stamens “usually enclosed by the petals” (Mueller 1888, p. 53).

This extreme opinion was not accepted by subsequent taxonomists. Weberbauer (1895) and Suessenguth (1953) to an even greater extent, followed Bentham and Hooker in their treatments of the Australian Rhamnaceae for the first and second editions of *Die natürlichen Pflanzenfamilien*.

However, neither accepted *Stenanthemum*, as both included its species within *Cryptandra*. Weberbauer complained that “the form structures of the flowers and fruits” is given too much emphasis in the definition of the genera of Pomaderreae, the limits of which he described as “rather weak” (Weberbauer 1895, p. 421; translated by Barker et al. 1988). In the ‘key to genera’, Suessenguth used mostly one character, the length of the floral tube, to distinguish between the Australian genera of Rhamnaceae. By doing this, he continued a ‘tradition’ of relying chiefly on this single character of floral morphology, which was taken up in many publications, particularly for the distinction between *Spyridium* and *Cryptandra* (e.g., Rodway 1903; Curtis 1956; Canning & Jessop 1986; Harden 1990). But, as Thiele & West (2004, p. 824) noted after examining these two genera, the hypanthium “varies widely and there is a continuous grade in both genera from species in which the tube is very short or indistinct to species in which it is distinct”.

The division of the Australian Rhamnaceae into four main genera was maintained in the following decades and species of *Stenanthemum* usually remained in *Cryptandra* or *Spyridium* (see, e.g., Blackall & Grieve 1956; Barker 1981; Cunningham et al. 1981; Conn 1983; Canning & Jessop 1986; Barker et al. 1988; Wheeler 1987) until Rye (1995a) re-instated the genus. A few authors, such as Baillon (1875), Rodway (1903) and Diels & Pritzl (1904), did accept *Stenanthemum*. Bailey (1899), Maiden & Betche (1902), Stanley & Ross (1986) and Bean (2004) recognised *Stenanthemum scortechinii* (F.Muell.) F.Muell. ex F.M.Bailey; however, this is actually a species of *Spyridium* (Thiele & West 2004).

The limits of genera in the tribe Pomaderreae have long been problematic, because of the importance of rather cryptic characters and the fact that early botanists did not adequately survey floral characters in the group, but instead relied on gross morphological features, such as the length of the hypanthium tube. A lack of good flowering and fruiting material might have contributed to the issue as well. Important characters include, for instance, the type of bracts and stipules, position and type of disc, indumentum on the ovary roof, the way the fruit and fruitlets dehisce and the kind of disseminule. Some of these were already known by botanists, such as Reissek (1848, 1858) or Mueller (1862) but their full importance was only revealed recently in the publications of Barker (1995; referring also to unpublished work by K.R. Thiele and B.L. Rye), Rye (1995a, b; 1996, 2001), Thiele & West (2004), Kellermann et al. (2005), Thiele (2007) and Kellermann (2006). Thiele & West (2004), Kellermann (2006) and Thiele (2007) also provide lists of diagnostic characters for *Cryptandra*, *Spyridium*, *Stenanthemum* and *Trymalium*.

Spyridium waterhousei and its generic placement

Spyridium waterhousei is a shrub up to 5 m tall, which occurs along creeklines, sugar gum (*Eucalyptus cladocalyx* F.Muell.) groves and woodlands. In the protologue, Mueller (1862) emphasised the viscid long linear leaves with revolute margins, and few-flowered terminal cymes consisting of “pedicellate flowers” that have three bracts surrounding the calyx-tube. The long, sticky leaves are certainly characteristic for the species. However, the flowers of *S. waterhousei* do not have true pedicels.

Cryptandra has solitary, sessile flowers that are surrounded by rows of spirally arranged bracts. Flowers in *Spyridium* are sessile and arranged in cymose inflorescences (Thiele & West 2004). Kellermann (2006, p. 102) reported for *Spyridium daltonii* (F.Muell.) Kellermann that flowers, which appear to be pedicellate, are better interpreted as “one-flowered unit-inflorescences, since each flower is immediately subtended by 2–3 cymose bracts”. Correspondingly, the flowers of *S. waterhousei* that Mueller (1862) described as ‘pedicellate’ are reduced one-flowered inflorescences, subtended by cymose bracts; the individual flowers are sessile. As such, the species has a typical *Spyridium* inflorescence (Thiele & West 2004), except that the number of flowers is reduced. Mueller’s ‘pedicel’ is actually the peduncle of a unit-inflorescence.

Mueller further described *Spyridium waterhousei* as having floral leaves that are covered with a felty indumentum and are slightly wider and shorter than the vegetative leaves, cucullate petals, which contain the anthers, a slightly trilobed undivided style, and fruits with persistent calyx lobes that contain three indehiscent, “crustaceous and chartaceous” fruitlets. Most of these characters are now seen to be typical for *Spyridium*, in particular the presence of floral leaves, which are

unknown in *Cryptandra*. The fruitlets in *Spyridium waterhousei*, however, differ from other species of the genus, since they are not particularly papery, but exhibit a harder, bony texture. The fruitlets are typical for *Spyridium* in respect to the thin crystal layer that covers the outer surface and because they are shed whole and act as the disseminule (Thiele & West 2004).

Other characters that place the species well within *Spyridium* are the strongly undulate disc that is indented away from the bases of the filaments and the stipules, which are fused behind the petiole for up to about half of their length. The stipules are not fused around the base of the petiole, as is characteristic for species of *Cryptandra* (Barker 1995; Thiele & West 2004).

The calyx-tube in *Spyridium waterhousei* extends slightly above the disc; a fact noted by Mueller, who described the flower as being campanulate. However, this was reason enough for Benthams to transfer the species to *Stenanthemum* in 1863². Thiele & West (2004) discussed three closely related species of *Spyridium* that all have a very long hypanthium tube and were for decades included in *Cryptandra*. A similar case is *Spyridium waterhousei*, which was one of the many species Mueller (1882) transferred into his amplified *Cryptandra*. Since then, all publications have referred to it as *Cryptandra waterhousei* (see taxonomic section for references).

Schomburgk (1875), in the first published list of South Australian plants, was the only author who used Benthams name *Stenanthemum waterhousei*. Despite the fact that Benthams had transferred the species to *Stenanthemum*, Tate continued to follow Mueller (1862) in his first census for South Australia, and an enumeration of plants occurring on Kangaroo Island (Tate 1880, 1883). There do not appear to be any contemporary references to Kuntze’s (1891) *Solenandra waterhousei*.

Recent molecular systematic analyses have corroborated the morphological evidence for placing the species in *Spyridium*. Using sequence data from nuclear internal transcribed spacer DNA, Kellermann et al. (2005) showed that this species is nested deep within the genus *Spyridium* in a sub-clade consisting of south-eastern Australian species. The same result was produced with data from the chloroplast *trnL-F* region (Kellermann, Udovicic & Ladiges, unpubl. results). The re-instatement of *Spyridium waterhousei* under its original name is long overdue and resolves 150 years of confusion about its generic affinities.

² The inclusion of *Spyridium waterhousei* into *Stenanthemum* weakened Benthams (1863) concept of the genus, since it was the only species that did not fit the generic description properly. For instance, in the generic description of *Stenanthemum*, Benthams characterises the fruitlets as “opening in 2 valves” (p. 435); but in the description of *S. waterhousei* he classifies the fruitlets correctly as “indehiscent” (p. 437). Perhaps *Stenanthemum* as a genus would have been adopted more easily by subsequent botanists, if Benthams had not contradicted his own definition of it.

Taxonomy

Spyridium waterhousei F.Muell.

Fragm. 3: 83 (Sep. 1862), as '*Sp. Waterhousii*'; Tate, Trans. & Proc. Rep. Roy. Soc. South Australia 3: 66 (1880) & 6: 159 (1883). — *Stenanthemum waterhousei* (F.Muell.) Benth., Fl. Austral. 1: 436 (1863), as '*St. Waterhousii*'; M.R.Schomb., Fl. S. Austral. 37 (1875). — *Cryptandra waterhousei* (F.Muell.) F.Muell. Syst. Census Austral. Pl. 61 (1882), as '*C. Waterhousii*'; Tepper, Trans. & Proc. Rep. Roy. Soc. South Australia 10: 288 (1888); F.Muell., Sec. Syst. Census Austral. Pl. 104 (1889); Tate, Trans. & Proc. Rep. Roy. Soc. South Australia 12: 64–65, 94 (1889); Handb. Fl. Extratrop. S. Austral. 98, 233 (1890); Weberb. in Engl. & Prantl, Nat. Pflanzenfam. III(5): 421 (1895); J.M.Black, Fl. S. Austral. 3: 371 (1926); J.G.Wood, Trans. & Proc. Roy. Soc. South Australia 54: 114, 134 (1930); J.M.Black, Fl. S. Austral. ed. 2, 3: 552 (1952); Suesseng. in Engl. & Prantl, Nat. Pflanzenfam. ed. 2, 20d: 118 (1953); Galbraith, Field Guide Wild Fl. S. Austral. 234 (1977); J.H.Leigh et al., Rare Threat. Austral. Pl. 42 (1981); Jessop, List Vasc. Pl. S. Austral. 76 (1983) & ed. 2, 38 (1984); Canning in Jessop & Toelken, Fl. South Austral. 2: 810 (1986); I.Jackson, Fl. Kangaroo Island 153 (1988); W.R.Elliott & D.L.Jones, Encycl. Austr. Pl. 3: 123 (1989); W.R.Barker in Jessop, J. Adelaide Bot. Gard. 12: 62 (1989); Hnatiuk, Cens. Austr. Vasc. Pl. 542 (1990); W.R.Barker in Jessop, List Vasc. Pl. S. Austral. ed. 4, 55 (1993); W.R.Barker, J. Adelaide Bot. Gard. 16: 20–21 (1995); A.Prescott, Blue Five Petals Kangaroo Island 52 (1995); J.D.Briggs & J.H.Leigh, Rare Threat. Austral. Pl. ed. 2, 161 (1996); W.R.Barker et al., J. Adelaide Bot. Gard. Suppl. 1: 90 (2005). — *Solenandra waterhousei* (F. Muell.) Kuntze, Rev. Gen. Pl. 1: 121 (1891), as '*So. Waterhousii*'. — **Type citation**: "In insula halmaturorum ad basin montium Freestone Range. F. Waterhouse". **Lectotype (here designated)**: Salt lagoon at the north foot of the Freestone Range, [Kangaroo Island, SA, 1861.] *F.G. Waterhouse s.n.* (MEL 2103248; Fig. 2). **Isolectotype**: MEL 2263634. **Possible isolectotype**: Kangaroo Island, [SA, 1861.] *F.G. Waterhouse s.n.* (K ex herb. Hooker).

Common name. The previous common name of the species was "long-leaved cryptandra" (Canning & Jessop 1986). As this name includes the genus, a new common name is desirable. "Long-leaved spyridium" is suggested as a possible replacement.

Illustrations. J.M. Black, *Flora of South Australia*, 3: 354, Fig. 161A (1926) & ed. 2, 3: 544, Fig. 702A (1952); D.S. Overton & B.M. Overton, *Field notes on Kangaroo Island wildflowers*, [10] (1985); E.M. Canning in J.P. Jessop & H.R. Toelken, *Flora of South Australia*, 2: 809, Fig. 427H (1986); I. Jackson, *The flora of Kangaroo Island: from the sketchbooks of Ida Jackson*, 152, Fig. 187 (1988); I. Holliday, B.M. Overton & D.S. Overton, *Kangaroo Island's native plants*, 25 (1994), photograph; W.R. Barker, *J. Adelaide Bot. Gard.* 16: 21, Fig. 2E (1995), stipules only; A. Prescott, *It's blue with five petals: Kangaroo Island field guide*, 52, Fig. 3 (1995). All illustrations as '*Cryptandra waterhousii*'.

Typification. The lectotype specimen at MEL consists of two flowering branches. It is labelled by Waterhouse with the location and also bears an annotation in Mueller's handwriting: "Differt a *Spyrid. vexillifero* fruct majoribus, coccis subcrustc (non membr) foliis longioribus, inflorescentia &c". A second

sheet at MEL has the same locality label written by Waterhouse; it consists of one flowering branch. The specimen from the *Herbarium Hookerianum* (K) has two flowering branches similar to the lectotype and is labelled "*Stenanthemum waterhousii* Kangaroo Island Waterhouse" by Bentham. It would have been examined by him when transferring the species from *Spyridium* to *Stenanthemum* (Bentham 1863) and was most certainly forwarded by Mueller to Bentham.

The 'Freestone Range' mentioned in the protologue and on the specimen labels must refer to Freestone Hill in the north-east of Kangaroo Island. The search for other type material of the species at AD and NSW was unsuccessful.

Note. The correct spelling of the epithet is '*waterhousei*' (Greuter et al. 2000), not '*waterhousii*' as used in the recent editions of the *Flora of South Australia* (Canning & Jessop 1986) and the census of South Australian plants (Barker et al. 2005).

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Fig. 2. *Cryptandra waterhousei*. Photograph of lectotype (F.G. Waterhouse s.n., MEL 2103248).

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Two new species of Australian *Stenanthemum* (Rhamnaceae), with a conspectus and key to species outside Western Australia

K.R. Thiele

Western Australian Herbarium, Department of Environment and Conservation, Locked Bag 104,
Bentley Delivery Centre, Western Australia 6983
Email: Kevin.Thiele@dec.wa.gov.au

Abstract

Stenanthemum comprises c. 30 species of small shrubs from south-western, central, southern and north-eastern Australia. Two new species, *S. arens* and *S. centrale*, are described and illustrated, and a synopsis and key provided for the seven species of *Stenanthemum* that occur outside Western Australia.

Introduction

Stenanthemum was described by Reissek (1858) to encompass a number of species of Australian *Spyridium* Fenzl and *Cryptandra* Sm. that appeared to him to be misplaced in those genera. Of all the members of the Australian stellate-haired Rhamnaceae (tribe Pomaderreae of Richardson et al. 2000), *Stenanthemum* was historically the most poorly understood and least recognised genus until Rye (1995, 2001) resurrected it and described many new taxa from Western Australia.

This paper describes two new species of *Stenanthemum* which occur in South and Central Australia. The genus now comprises c. 30 species, most endemic to south-western Western Australia where it is one of the most species-rich genera in the family. Five taxa (*S. petraeum*, *S. leucophractum*, *S. notiale* subsp. *notiale*, *S. pimeleoides* and *S. argenteum*), in addition to the new species here described, occur in eastern Australia.

Taxonomic history

In Reissek's treatment of the three genera *Cryptandra*, *Stenanthemum* and *Spyridium*, *Spyridium* comprised species with a short, non-tubular hypanthium, flowers in contracted head-like cymes and a glabrous disk, *Cryptandra* comprised species with a tubular hypanthium and densely tomentose disk, and *Stenanthemum* comprised species with the floral morphology of *Cryptandra* but with an indistinct, glabrous disk.

Bentham (1863) accepted Reissek's genus (although with a different circumscription). He regarded *Stenanthemum* as having the "floral characters of *Cryptandra* and the inflorescence of *Spyridium*", noting that *Cryptandra* flowers are mostly solitary and surrounded individually by imbricate bracts, while *Spyridium* and *Stenanthemum* usually have flowers in dense, cymose heads with bracts surrounding the

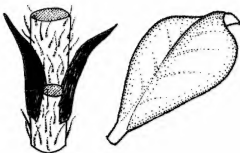
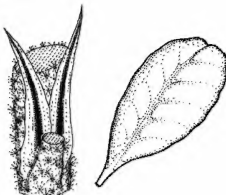
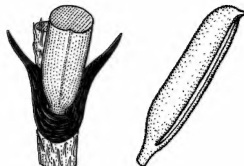
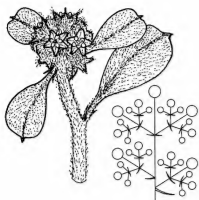
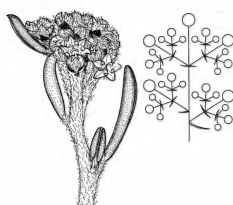

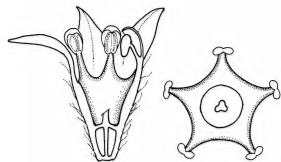
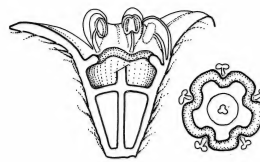
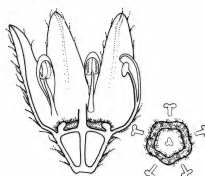
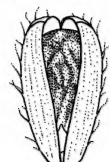

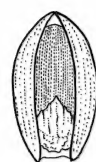
whole inflorescence. Bentham further commented on the difficulties of adequately delimiting genera in the Australian Rhamnaceae, noting that differences between genera were often "very trifling".

Mueller (1883) found the differences to be so "trifling" that he radically departed from previous treatments of the genera by reducing *Stenanthemum*, *Spyridium* and *Trymalium* to synonymy under a very broadly circumscribed *Cryptandra*, allowing only *Pomaderris* among the stellate-haired taxa to remain distinct. Although *Spyridium* and *Trymalium* have since been completely reinstated, *Stenanthemum* remained in relative obscurity for over a century after Mueller's treatment. Recent authors (e.g. Blackall & Grieve 1956; Conn 1983; Canning 1986; Wheeler 1987; Barker 1989, 1993; Harden 1990) failed to take up Reissek's genus, and all species published in or transferred to *Stenanthemum* were included in either *Cryptandra* or *Spyridium*.

Although the genus was reinstated by Rye (1995), the absence of clearly defined diagnostic differences between *Stenanthemum* and related genera has led to continuing uncertainty as to generic limits in the group. Bean (2004), for example, reinstated *Stenanthemum scortechinii* (F.Muell.) Maiden & Betche (basionym: *Cryptandra scortechinii*), an eastern Australian species that clearly belongs in *Spyridium* (see Thiele & West 2004), while three taxa from Western Australia, (*Stenanthemum gracilipes* Diels, *S. grandiflorum* (C.A. Gardner) Rye ms and *S. intropubens* Rye ms, require re-assignment to new genera (see Kellermann et al. 2005, Rye 2001).

Cladistic analyses based on morphological (Thiele, unpublished data) and sequence data (Kellermann et al. 2005) have shown that *Stenanthemum* (after removal of the taxa discussed above) is a natural one. The principal morphological features distinguishing *Stenanthemum* from *Spyridium* and *Cryptandra* are given in Table 1.

Table 1. Principal diagnostic differences of *Stenanthemum*, *Spyridium* and *Cryptandra*

<i>Stenanthemum</i>	<i>Spyridium</i>	<i>Cryptandra</i>
<p>Leaves usually broad, often folded; stipules free or connate behind the petiole</p> 	<p>Leaves usually broad, rarely folded; stipules free or connate behind the petiole</p> 	<p>Leaves usually revolute-terete; stipules connate around the base of the petiole</p> 
<p>Inflorescences dense, cymose heads; floral bracts small or large, surrounding the head</p> 	<p>Inflorescences dense or loose cymose heads; floral bracts usually large, surrounding the head</p> 	<p>Inflorescences single flowers; floral bracts imbricate around the base of the flower</p> 
<p>Free hypanthium short to long; floral disk glabrous, lining the hypanthium tube and often confluent with the filament bases (sometimes apparently lacking); ovary fully inferior at anthesis, remaining so after anthesis</p> 	<p>Free hypanthium usually very short; floral disk glabrous, usually forming a shelf at the summit of the hypanthium tube, indented at the filament bases; ovary fully inferior at anthesis, remaining so after anthesis</p> 	<p>Free hypanthium short to long; floral disk usually densely tomentose, forming a sinuate ring around the base of the ovary; ovary often partly superior at anthesis, becoming more so after anthesis</p> 
<p>Fruitlets dehiscent by a slit to release the arillate seed; seed spotted or mottled (rarely uniform)</p> 	<p>Fruitlets indehiscent, usually papery, shed whole as the disseminule; seed uniform, spotted or mottled</p> 	<p>Fruitlets dehiscent by a slit to release the arillate seed; seed uniformly coloured</p> 

The shape of the floral disk (lining the hypanthium and confluent with the staminal filaments) is a morphological synapomorphy for the genus.

Stenanthemum Reissek

Linnaea 29:295 (1858). — *Spyridium* sect. *Stenanthemum* (Reissek) F.Muell., Fragm. 3: 77 (1862), nom. inval. — *Cryptandra* sect. *Stenanthemum* (Reissek) Suesseng., Nat. Pflanzenfam. ed. 2, 20d: 118 (1953). **Lectotype:** *Stenanthemum leucophractum* (Schldl.) Reissek, fide Rye, Nuytsia 13: 496 (2001).

Cryptandra subg. *Solenandra* Reissek in Lehm. Pl. Preiss. 2: 288 (1848). — *Solenandra* (Reissek) Kuntze, Rev. Gen. Pl. 1: 120 (1891) non Hook.f., in Benth. & Hook.f., Gen. Pl. 2(1): 43 (1873), nom. illeg. — *Cryptandra* sect. *Solenandra* (Reissek) T.Post & Kuntze, Lex. Gen. Phan. 150 (1903). **Type:** not designated.

Evergreen, small shrubs, usually without spinescent short-shoots, with simple and/or stellate hairs on shoots, leaves and flowers. Leaves alternate, sometimes crowded and \pm fasciculate, entire or with a few teeth at the apex, shortly petiolate, usually discolorous, usually folded (conduplicate) at least at the apex; stipules free to connate (to about half their length) behind the petiole, persistent, scarious. Inflorescences comprising dense, contracted, cymose heads, usually terminal but often made lateral by vegetative growth from subtending buds, sometimes subtended by whitish floral leaves; bracts persistent, often larger than stipules. Flowers bisexual, 5-merous, \pm sessile. Hypanthium produced into a free tube, persistent on the fruit. Sepals usually \pm spreading at anthesis. Petals cucullate, \pm clawed, smooth, erect. Stamens subequal to petals, erect. Disk usually conspicuous (sometimes apparently lacking), smooth, glabrous, lining the base of the hypanthium tube and appearing confluent with the adnate staminal filaments. Ovary inferior at anthesis, remaining so after anthesis, the ovary summit glabrous or pubescent; carpels 3; style almost entire to slightly lobed. Fruit a schizocarpic capsule, the fruitlets splitting along their inner faces to release the seeds. Seeds cream, fawn or brown usually irregular spotted or mottled, the lower $\frac{1}{3}$ – $\frac{2}{3}$ of the seed body covered by a translucent, 3-lobed aril.

30 species endemic to Australia, mostly in southwestern Western Australia.

Synopsis of *Stenanthemum* species occurring outside Western Australia¹

Key to the species of *Stenanthemum* in states other than Western Australia¹

- 1 Ovary summit (around the style base inside the hypanthium tube) stellate-hairy
- 2 Leaves glabrous and tuberculate above; flowers woolly or villous. *S. petraeum*
- 2: Leaves with stellate and/or simple hairs above; flowers shortly pubescent *S. notiale* subsp. *notiale*
- 1: Ovary summit glabrous
- 3 Stem leaves glabrous and tuberculate or scabrid above

- 4 Flowers woolly with spreading, white hairs
- 5 Leaf margins narrowly recurved, leaves otherwise flat; Tas. *S. pimeleoides*
- 5: Leaves folded, the margins not recurved; S.A., Vic., N.S.W. *S. leucophractum*
- 4: Flowers villous or sericeous with \pm appressed, rusty to silvery hairs
- 6 Leaves narrowly obovate, 6–14 mm long, 2–3 mm wide; NE Qld. *S. argenteum*
- 6: Leaves broadly obovate to almost orbicular, 2–7 mm long and wide; S.A. *S. arens*
- 3: Stem leaves stellate-hairy above
- 7 Free hypanthium tube 0.9–1.2 mm long; S.A. *S. arens*
- 7: Free hypanthium tube 2.8–3.5 mm long; N.T. *S. centrale*

Stenanthemum petraeum Rye

Nuytsia 19(2): 298 (1995). **Typus:** 189 km N of Neale Junction, Western Australia, 28 July 1974, A.S. George 12000; holo: PERTH 01515411!; iso: CANB!, MEL!.

Woody, erect shrub to 1.5 m high, with greyish, densely simple-pubescent young stems. Leaf lamina broadly obovate to almost orbicular, (3–)8–15 mm long, (4–)8–10 mm wide, flat or folded, glabrous and tuberculate above, appressed silvery-villous beneath; base cuneate; apex obtuse to acute, rarely emarginate, recurved; petiole 1–2.5 mm long; stipules 2–3 mm long, triangular, connate. Inflorescences to 1 cm wide, with 15–50 flowers. Flowers white-villous or woolly. Hypanthium tube 1–1.5 mm long, 1–2 mm diameter. Sepals 1–1.8 mm long. Petals 0.8–1.1 mm long, distinctly clawed. Disk conspicuous. Ovary roof stellate-hairy; style 1.5–2.3 mm long. Fruit 2–3 mm long. Seed 1.5–1.6 mm long.

Widely distributed in inland Western Australia and Northern Territory, between Mt Augustus and Laverton in the west and Glen Edith in the east, usually on stony slopes with *Triodia*. Flowers and fruits: throughout the year.

Stenanthemum notiale Rye subsp. *notiale*

Nuytsia 19(2): 297 (1995). **Typus:** c. 17 km NNW of Young River crossing on Ravensthorpe – Esperance road, Western Australia, E.N.S. Jackson 1296; holo: PERTH 01541315!; iso: AD!, CANB!.

Cryptandra tridentata auct. non Steud.; auct. Austral. — *Spyridium tridentatum* auct. non (Steud.) Benth., auct. Austral.

Prostrate to erect shrub to 0.6 m high, with greyish or rusty, sparsely to (rarely) densely stellate-pubescent young stems. Leaf lamina (3–)5–8(–12) mm long, (2–)3–6 mm wide, flat or folded, moderately to densely greyish-pubescent above with simple and/or stellate hairs, pubescent to villous beneath with grey or rusty, simple and/or stellate hairs; base cuneate; apex acute or obtuse and recurved-apiculate, rarely emarginate; petiole 0.5–2.0 mm long; stipules 1.5–3.5 mm long, ovate to broadly triangular, connate. Inflorescences to 0.8 cm wide, with 10–20 flowers. Flowers densely greyish-pubescent or villous with simple and/or stellate hairs. Hypanthium tube to 0.4 mm long, 0.6–1.2 mm

¹ see Rye (2001) for a key to and synopsis of Western Australian taxa.

diameter. Sepals 0.8–1.2 mm long. Petals 0.5–0.7 mm long, distinctly clawed. Disk conspicuous. Ovary roof stellate-hairy; style 0.6–0.7 mm long. Fruit 2–2.2 mm long; seed 1.1–1.5 mm long.

Widely distributed in south-west Western Australia between Geraldton and Israelite Bay, and also in South Australia on central Eyre Peninsula and in north-west Victoria between Annuello and Hattah, in woodlands, heath and mallee-heath. Flowers and fruits: throughout the year.

Bentham (1863) initiated a broad concept of *Spyridium tridentatum* (Steud.) Benth., which was followed by all Australian authors until Rye (1995) resolved it into five distinct species of *Stenanthemum*. Of these, only *Stenanthemum notiale* occurs outside Western Australia.

***Stenanthemum pimeleoides* (Hook. f.) Benth.**

Fl. Austral. 1: 436 (1863). — *Cryptandra pimeleoides* Hook. f., Fl. Tasman. 75, t. 12B (1855). — *Solenandra pimeleoides* (Hook. f.) Kuntze, Revis. Gen. Pl. 1: 121 (1891) (as '*pimelodes*'). **Typus:** Spring Bay, *Gunn 1041*; iso: K, BM (photos seen)

Prostrate, small shrub with greyish- or rusty-villous young stems. Leaf lamina obovate to almost flabellate, 2–7 mm long, 2–6 mm wide, narrowly recurved, glabrous and minutely tuberculate above, appressed-villous below; base cuneate; apex obtuse; petiole 1–2.5 mm long; stipules 2.5–7 mm long, narrowly triangular, connate behind the petiole, often overlapping and sheathing the stems. Inflorescences to 1 cm wide, with 10–50 flowers, subtended by a few white floral leaves. Flowers densely greyish-woolly; hypanthium tube 2.4–2.7 mm long, 0.8–1.2 mm diameter, glabrous at base. Sepals 0.8–1.2 mm long. Petals 0.6–0.7 mm long, distinctly clawed. Disk apparently absent. Ovary roof glabrous; style (2.2–)3.5–3.8 mm long. Fruit 2–2.5 mm long. Seed 1.2–1.4 mm long.

Endemic to eastern Tasmania, on the east coast between Orford and Bicheno, in heathland and forest. Flowers: Dec.–Feb.

***Stenanthemum leucophractum* (Schldtl.) Reissek**

Linnaea 29:295 (1858). — *Cryptandra leucophracta* Schldtl., Linnaea 20: 640–642 (1847). — *Spyridium leucophractum* (Schldtl.) F.Muell., Fragm. 3: 77 (1862). — *Solenandra leucophracta* (Schldtl.) Kuntze, Revis. Gen. Pl. 1: 121 (1891). **Typus:** South Australia, *Behr s.n.*; holo: HAL (photo seen)

Small, spreading shrub to 40 cm (rarely to 1 m) high, with rusty or greyish densely villous or pubescent young stems. Leaf lamina obovate to broadly obovate, 3–(10) mm long, 2–6 mm wide, flat or folded, glabrous and tuberculate above, grey or rusty and appressed-villous beneath; base cuneate; apex obtuse and recurved-apiculate, rarely acute; petiole 0.5–2 mm long; stipules 2–4 mm long, narrowly triangular, connate. Inflorescences to 1 cm wide, with 15–40 flowers, subtended by whitish floral leaves. Flowers white

woolly-hirsute. Hypanthium tube 2.5–3.5 mm long, 0.8–1.0 mm diameter. Sepals 1.0–1.2 mm long. Petals 0.5–0.6 mm long, distinctly clawed. Disk apparently absent. Ovary roof glabrous; style 3.5–4.0 mm long. Fruit 2.0–3.0 mm long. Seed 1.5–1.8 mm long. *Rusty poison, white cryptandra.*

Widespread in mallee scrub from Eyre Peninsula and Kangaroo Island, South Australia to the Little Desert, Victoria, with an outlying population between Hillston and Ardlethan, New South Wales. Flowers and fruits: Sept.–Dec.

***Stenanthemum argenteum* A.R. Bean**

Austrobaileya 6(4): 935 (2004). **Typus:** Queensland: Cook District: The Pepperpot, Mt Mulligan, c. 40 km NW of Dimbulah, 31 May 1985, *J.R. Clarkson 5949*; holo: BRI!; iso: L, MEL, MO, NSW

Low shrub 0.5–0.75 m high with dense, appressed, silvery-villous indumentum on young stems, leaf undersurfaces and flowers. Leaf lamina narrowly obovate, 6–14 mm long, 2–3 mm wide, flat or folded, glabrous and scabrid above; base narrowly cuneate; apex obtuse to acute, recurved-apiculate; petiole 1–1.5 mm long; stipules 1.5–2.5 mm long, narrowly triangular, free. Inflorescences to 0.5 cm wide, with 5–10 flowers. Hypanthium tube 2–2.5 mm long, 1.5 mm diameter. Sepals 1.5–2 mm long, erect or spreading. Petals 1.5 mm long, distinctly clawed. Disk inconspicuous. Ovary roof glabrous; style 3–3.5 mm long.

Endemic to north Queensland on Mts Mulligan and Janet, in woodland on steep pavements in heathland. Flowers: Sept.

***Stenanthemum arens* K.Thiele, sp. nov.**

Stenanthemum sp. Gawler Ranges (*J.Carrick 2457*) K.R. Thiele in Barker et al., J. Adelaide Bot. Gard. Suppl. 1: 91 (2005). **Typus:** At foot of Mt. St. Mungo [2 October 1969], *J. Carrick 2457*; holo: AD; iso: CANB, PERTH.

Species unica in genere Stenanthemo, distinguenda tecto ovarii glabro, foliis caulis plerumque dense stellato-pubescentibus supra, foliis circum inflorescentiam in folia floris densius pubescentia et latiora mutatis, hypanthio plus minusve uniformiter villosa tubo libero 0.9–1.2 mm longo, et disco prominenti et profunde indentato inter filamenta staminum.

Twiggy shrub. Young stems moderately to densely pubescent or villous with ± appressed, flexuose, greyish or rusty, simple or substellate hairs, persisting to older stems of current season's growth. Leaves ± concolorous or distinctly discolorous; lamina broadly obovate to almost orbicular, (2–)4–7 mm long and wide, entire, flat or folded, usually densely greyish-stellate above, densely villous beneath with rusty hairs, especially along the veins, over a greyish, stellate sub-indumentum, rarely both surfaces glabrescent; venation penninerved, the veins obscure or clearly visible beneath; base cuneate; apex obtuse and recurved-apiculate, rarely emarginate; petiole (0.5–)1–2 mm long; stipules 2–4 mm long, narrowly triangular to linear-filiform, attenuate, free or shortly connate, abaxially sparsely pubescent or villous. Inflorescences terminal or lateral, to 1 cm wide, with

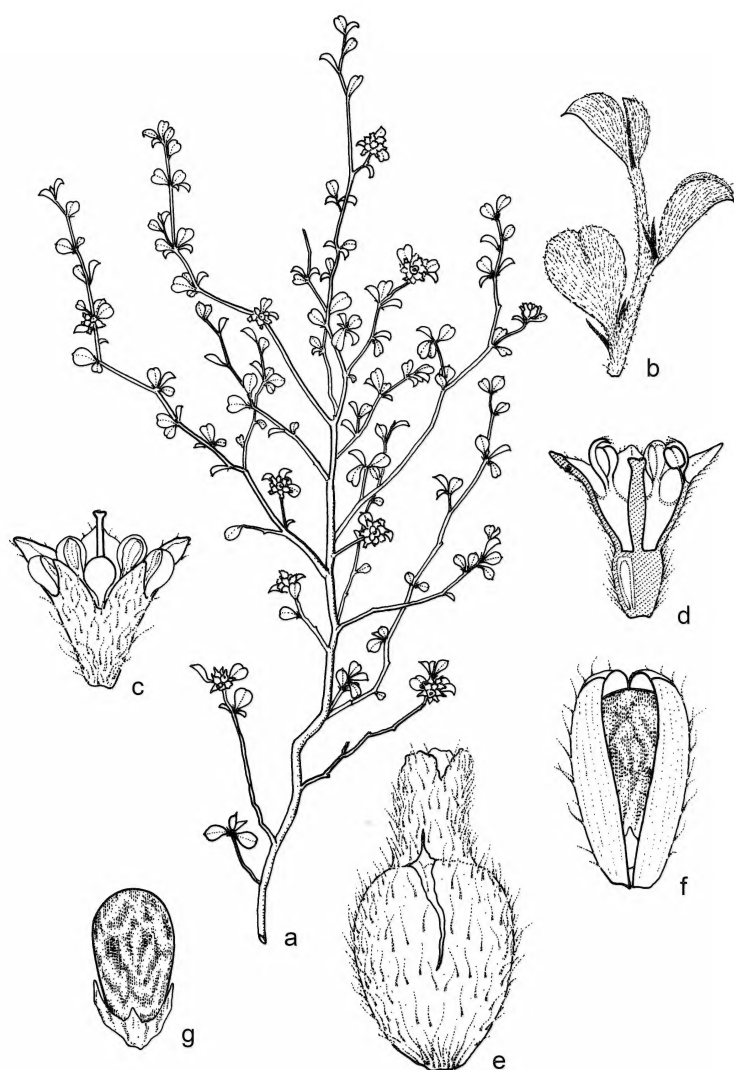


Fig. 1. *Stenanthemum arens*. **a** Habit $\times 1$; **b** Leaves and stipules $\times 3$; **c** Flower $\times 10$; **d** Flower in longitudinal section $\times 10$; **e** Fruit $\times 10$; **f** Fruitlet and seed, adaxial $\times 10$; **g** Seed $\times 10$. (Carrick 2457 except c-d, Scoles 40).

10–20 flowers, usually with subtending whitish floral leaves (though these scarcely differentiated from stem leaves); bracts ovate to triangular, 1.5–2.5 mm long, acute or awned, ciliate on the margins, sparsely to moderately villous or pubescent. Pedicels to 0.2 mm long, moderately to densely villous. Hypanthium tube 0.9–1.2 mm long, 1.2–1.5 mm diameter, moderately villous or sericeous with flexuose, loosely appressed, silvery, mostly simple hairs, the hairs slightly longer and denser at the base. Sepals 1.2–1.4 mm long, spreading,

pubescent to villous, the hairs slightly shorter and denser than those on the hypanthium, otherwise similar. Petals 0.7–0.8 mm long, erect, smooth, with a few hairs along the midline on the back, indistinctly clawed. Stamens 0.6–0.8 mm long, erect; anthers 0.5–0.6 mm long. Disk conspicuous, deeply scalloped between the staminal filament bases. Ovary roof glabrous; style 1.7–1.9 mm long. Fruit 2.2–3 mm long, greenish or brown, obovoid, obtuse. Seed 1.6–1.8 mm long, irregularly mottled pale fawn and reddish-brown. Fig. 1.

Derivation of epithet. From the Latin *arens* (dry, parched), in reference both to the habitat and the appearance of the plant.

Distribution and habitat. Endemic to South Australia, on rocky hills in the north-west Gawler Ranges. Flowers :July; fruits: Sept.–Oct.

Notes. Similar in habit, habitat and general appearance to *Stenanthemum leucophractum*, which differs in having glabrous-tuberculate stem leaves and longer

(2.5–3.5 mm), white-woolly flowers. *Stenanthemum leucophractum* is widespread in the south-east Gawler Ranges but appears to be absent from the north-west Gawler Ranges where *S. arens* occurs.

Conservation Status. *Stenanthemum arens* occurs on grazing freehold, and is not known from conservation reserves. A conservation code of 2V (following the codes of Briggs & Leigh 1989) is suggested.

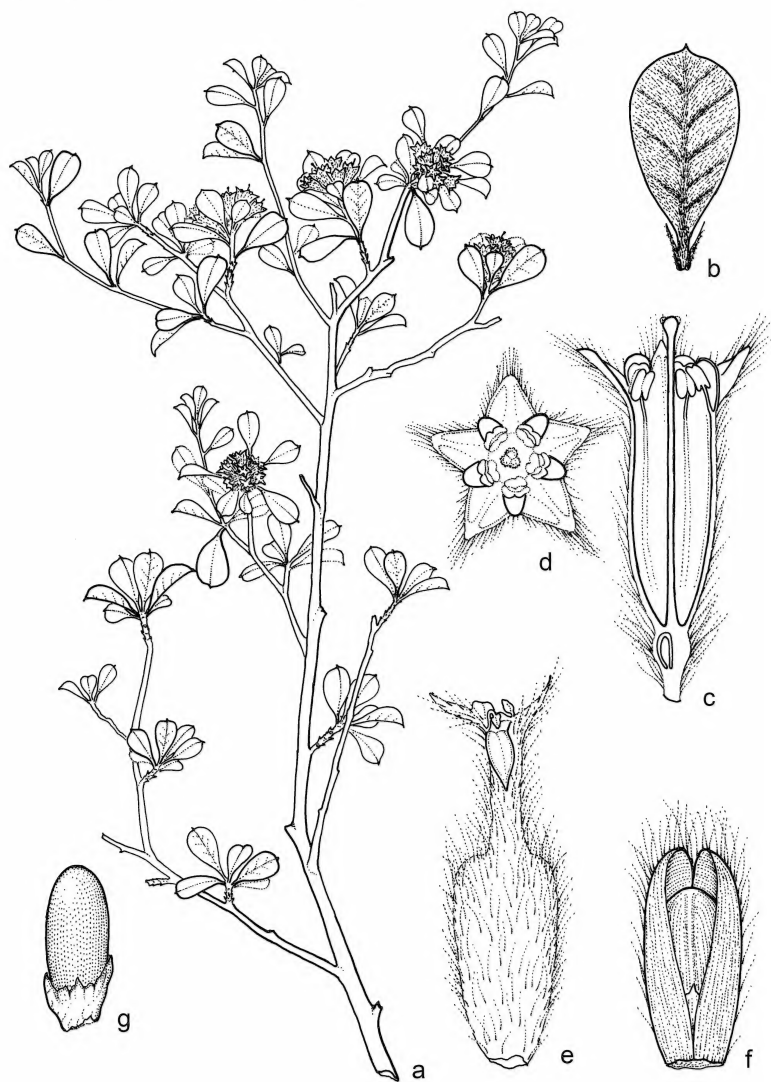


Fig. 2. *Stenanthemum centrale*. a Habit $\times 1$; b Leaf and stipules, abaxial $\times 3$; c Flower in longitudinal section $\times 10$; d Flower in plan view $\times 10$; e Fruit $\times 10$; f Fruitlet and seed, adaxial $\times 10$; g Seed $\times 10$. (Latz 1876 except e–g, Latz 11539).

Other specimens examined. SOUTH AUSTRALIA: Mt. Wallaby, c. 3 km WNW of Koondoolka HS., 24 Sept. 1972, *E.N.S. Jackson* 2034 (AD); c. 48 km E of Wirrulla, 10 July 1967, *D. Scoles* 40 (AD); Hiltaba Station, c. 3 km N of Hiltaba HS., 4 Sept. 1972, *B.J. Blaylock* 1892 (AD, PNH, PR); Hiltaba H.S., 3 Sept. 1972, *A.G. Spooner* 2240 (AD); Hiltaba Station, E of Barker [probably Barber] Hill, 16 June 1969, *G. Gardiner* s.n. (AD); Surrounding hills NE of Koondoolka HS., 23 Sept. 1972, *J.Z. Weber* 3041 (AD).

***Stenanthemum centrale* K.Thiele, sp. nov.**

Stenanthemum A83203 *Palm Valley*: C.R. Dunlop et al., Checkl. Vasc. Pl. Northern Terr. 97 (1995). — *Stenanthemum* sp. *Palm Valley* (*P.K.Latz* 10086): Cowie & Albrecht, Checkl. NT Vasc. Pl. [p. 45] (2005). **Typus**: Finke Gorge National Park, 1.5 km SW of confluence of Little Palm Creek and Finke River, 13 July 1995, *D.E. Albrecht* 6783; holotype: CANB; isotype: AD, DNA, MEL, PERTH, NT.

Species unica in genere Stenanthemo, distinguenda paginis adaxialibus foliorum dense stellato-pubescentibus et floribus albo-villosis tubo hypanthii 2.8–3.5 mm longo.

Woody, pale grey shrub to 1.5 m high. Young stems densely pubescent with loosely appressed or spreading, flexuose, greyish, simple or substellate hairs, persisting to older stems of current season's growth. Leaves ± discolorous; lamina obovate to broadly obovate, (6–)10–15(–18) mm long, 5–8 mm wide, entire, flat or folded, densely greyish-stellate above, densely silvery-villous with appressed hairs beneath, sometimes with scattered rusty hairs along the veins; venation penninerved, the veins clearly visible beneath; base cuneate; apex obtuse with a straight or recurved apiculum; petiole 1.5–3.5 mm long; stipules 2.5–4.5 mm long, narrow triangular, attenuate, free, sparsely to moderately pubescent abaxially. Inflorescences terminal or lateral, 0.6–1 cm wide, with 10–40 flowers, sometimes with subtending whitish floral leaves (though these scarcely differentiated from stem leaves); bracts ovate to triangular, 3–4 mm long, acute or bilobed, ciliate on the margins, densely villous. Flowers sessile. Hypanthium tube 2.8–3.5 mm long, 0.8–1.5 mm diameter, densely villous with loosely appressed to spreading, white or silvery, simple hairs, the hairs denser at the base. Sepals 1.2–1.5 mm long, erect or spreading, densely villous with hairs similar to those on the hypanthium. Petals 0.8–1.1 mm long, erect, glabrous, distinctly clawed. Stamens 0.8–1.1 mm long, erect; anthers 0.5–0.8 mm long. Disk apparently lacking. Ovary roof glabrous; style 3.5–4 mm long. Fruit c.3.5 mm long (not including the persistent, withered hypanthium), pale brown, obovoid, obtuse. Seed 2.0–2.5 mm long, reddish-brown, not mottled. Fig. 2.

Derivation of epithet. From the Latin *centrum* (central point), in reference to the distribution of the species in Central Australia.

Distribution and Habitat. Endemic to the MacDonnell Ranges bioregion of the Northern Territory, on slopes, ridges and rocky gorges of porous

sandstone with *Triodia* in the Krichauff, Waterhouse and James Ranges, south-west of Alice Springs (White et al. 2000). Flowers throughout the year.

Notes. Collections at DNA and MEL (*Kempe* 219) labelled “Finke River, S.A.” refer to the Finke River at Hermannsburg in Northern Territory, where Kempe was a missionary.

Similar in habit, habitat and general appearance to *S. petraeum*, which differs in having glabrous-tuberculate stem leaves, shorter (1–1.5 mm), woollier hypanthium, and a stellate-hairy ovary roof. *Stenanthemum petraeum* is widespread in inland Western Australia, extending east to Glen Edith and Laurie Ck in the Northern Territory (c. 100 km west of Areyonga). As far as is known, the two species ranges do not overlap.

Conservation Status. Most collections note that the plant is rare at the collection site. It occurs in Finke Gorge National Park, and is not under any known threat. White et al. (2000) note that it is able to persist in fire-prone and frequently burnt areas. A conservation code of 3RC- (following the codes of Briggs & Leigh 1989) is suggested.

Other specimens examined. NORTHERN TERRITORY: Glen of Palms, 1872, *E. Giles* s.n. (MEL); Finke River, 1880, *H. Kempe* 219 (DNA); Waterhouse Range S of Alice Springs, 3 Feb. 1976, *P.K. Latz* 6347 (DNA, NT); Palm Valley, 26 Dec. 1971, *P.K. Latz* 1876 (CANB, DNA); 1 km N of Palm Valley camping area, 18 July 1985, *P.K. Latz* 10086 (DNA, NT); James Range, 13 km S of Areyonga, 21 Sept. 1989, *P.K. Latz* 11593 (DNA, MEL, NT); 25 km NE of Areyonga, 22 June 1988, *D.J. Parsons* 47 (AREF, DNA, NT)

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***Malva preissiana* Miq., an overlooked name for *Lavatera plebeia* Sims (Malvaceae), with a note on variation within the species**

R.M. Barker^a & J.G. Conran^{b,c}

^aState Herbarium of South Australia, Hackney Road,
Adelaide, South Australia 5000

Email: barker.robyn@saugov.sa.gov.au

^bDiscipline of Environmental Biology, School of Earth and Environmental Sciences, Benham
Building DP312, The University of Adelaide, South Australia 5005

^cAustralian Centre for Evolutionary Biology and Biodiversity,
The University of Adelaide, South Australia 5005

Email: john.conran@adelaide.edu.au

Abstract

The name *Malva australiana* M.F.Ray, which replaced *Lavatera plebeia* Sims when *Lavatera* was merged with *Malva*, is predated by *M. preissiana* Miq. The relationship of this earlier name to variation within the species is discussed. The type specimen now falls within the less common white-flowered offshore island morphotype, sometimes recognised previously as *Lavatera plebeia* var. *tomentosa* Hook.f.

Many of the species of *Lavatera* (Malvaceae) occurring in Australia have been transferred to *Malva* by Ray (1998). Except for that of *L. assurgentiflora* Kellogg, the original epithets were already pre-occupied within *Malva* and new names were needed. Thus, the familiar *Lavatera cretica* L. became *Malva linnaei* M.F.Ray, *L. arborea* L. became *M. dendromorpha* M.F.Ray and *L. plebeia* Sims became *M. australiana* M.F.Ray.

However, in the case of *Lavatera plebeia* there were already two names available within *Malva*. Initially it was thought that *Malva behriana* Schltdl. was the only one available, hence its inclusion in the latest census of South Australian plants (W.R. Barker et al. 2005) by the first author, but the second has recently pointed to the earlier *M. preissiana* Miq. Its full synonymy is documented below.

***Malva preissiana* Miq.**

Miq. in Lehm., Plant. Preiss. 1(2): 238 (1845). **Type:** *L. Preiss* 1893, 14 Nov. 1839, crescit in insula Penguin-Island [S of Cape Peron, Rockingham, WA, fide Marchant (1990)]. **Holotype** (n.v., see Typification); **isotypes:** MEL 1528422 (ex Herb. Steetz); MEL 2282397.

M. behriana Schltdl., Linnaea 20: 633 (1847). — *Lavatera behriana* (Schltdl.) Schltdl., Linnaea 24: 699 (1852). **Type:** H.H.Behr, July [1845], In Thale des Murray-Flusses (n.v., HAL see Institute of Geobotany and Botanical Garden, Halle 2004).

M. australiana M.F.Ray, Novon 8: 291 (1998), replacement name for *Lavatera plebeia* Sims, Bot. Mag. 48: pl. 2269 (1821), non *M. plebeia* Stev., Bull. Soc. Nat. Mosc. xxix. (1856) 1. 325. — *Althaea plebeia* (Sims) Schult. ex Steud., Nom. Bot. ed. 2, 1: 210 (1840). **Type:** Sim's plate 2269 (see discussion by Ray 1998, p. 292).

Lavatera plebeia Sims var. *eremaea* J.M.Black, Fl. S. Austral. 3: 373 (1926). **Type citation:** "Ardrossan, Y.P.; Caroon, E.P. Ooldea; Franklin Islands; along the Great Bight". **Syntypes** (all from J.M.Black's herbarium at AD and annotated as var. *eremaea*): T.G.B. Osborn s.n., Jan 1922, Franklin Islands (AD 96303018); O. Tepper s.n., 1879, Ardrossan (AD 96303017 p.p.); R. Tate s.n., 8 Feb. 1879, Gully Bunda Cliffs E from Wilson Bluff (AD 96303017 p.p.); T. Richards s.n., Nov. 1879, Euria (AD 96303017 p.p.).

L. plebeia Sims var. *tomentosa* Hook.f, J. Bot.: 412 (1840). **Types:** Van Diemens Land, near Woolnoth, R. Gunn 655; New Holland, Cunningham. **Syntypes** (n.v., presumably at K).

L. australis Schrad. ex Colla, Hortus Ripulensis App. 1: 134 (1824), nom. nud.

Typification of *M. preissii*

The original specimens seen by Miquel will almost certainly be found in his herbarium in U or within the first set of *Plantae Preissianae* material in LD (Crisp 1983). As well as the isotypes seen in the National Herbarium of Victoria (MEL), Preiss collections are usually represented by numerous duplicates in other European herbaria

Variation within *Malva preissiana*

There are two distinctive morphotypes (variants) within *M. preissiana*. These have been recognised previously under *Lavatera plebeia* as var. *tomentosa* (Hooker 1840) and var. *eremaea* (Black 1926) for the white-flowered offshore island/coastal variant, with var. *plebeia* for the pink-flowered inland form (see also W.R. Barker 1986 for a brief discussion of differences

between these three varieties). In cultivation, plants attributable to var. *tomentosa* remain morphologically very distinct from var. *plebeia* under cross transplant experiments (Moore 1994). There are also instances where var. *plebeia* occurs on offshore islands or along coastlines, but there it remains strongly different from var. *tomentosa* (Keighery 1995; Keighery et al. 2002), and generally grows very poorly, producing tiny, stunted plants with much smaller flowers and fewer-seeded fruits (e.g. Rat Island in the Abrolhos Group). However, the two morphs do not differ in their ITS sequences (Conran unpubl. obs), suggesting that they are probably the same species based on ITS sequence divergence within and between *Malva* taxa (Ray 1995). Nevertheless, because these morphotypes are distinctive morphologically and ecologically, it is still important to note that the type for *M. preissiana* falls within the 'var. *tomentosa*' morphotype.

Excluded name

Malva tenuicalyx Ten.

Cat. Orto Bot. Napoli 87 (1845). **Type citation:** "Ten. Ind. sem. H. R. N. 1837. pag. 5." "Habitat in N. Hollandia?". **Holotype:** New Holland? without precise locality or collector (NAP?, n.v.).

The only other name within *Malva* applied to Australian material is *M. tenuicalyx* Ten. It is cited as having been grown from material possibly collected from Australia, but was described as having yellow flowers and a capsular fruit. There are no yellow-flowered *Malva* (or *Lavatera*) species with capsular fruits known for Australia, and it is quite probable that the taxon does not even belong in the Malvoideae if its fruit is truly a capsule.

The type specimen is likely to be held by Herbarium Neapolitanum (NAP) of the Università Degli Studi di Napoli Federico II (Holmgren & Holmgren 1998 onwards, De Castro & Menale 2004).

Acknowledgements

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Calycopeplus (Euphorbiaceae) not in South Australia

R.M. Barker^a & A.S. George^b

^aState Herbarium of South Australia,
Hackney Road, Adelaide, South Australia 5000
Email: barker.robyn@saugov.sa.gov.au

^bFour Gables^{*}, 18 Barclay Road, Kardinya, Western Australia 6163

Abstract

Calycopeplus ephedroides is removed from the South Australian census of plants after being recorded as occurring there by H.K. Airy Shaw in a 1980 publication on Australian Euphorbiaceae.

Calycopeplus ephedroides Planchon was first listed for South Australia, with *C. helmsii* F.Muell. & Tate as a synonym, when Airy Shaw (1980) indicated that the species occurred in Western Australia, South Australia and, questionably, the Northern Territory.

Since there was no material in the South Australian herbarium, W.R. Barker contacted Airy Shaw (in litt., 17 December 1982) to establish the basis of the South Australian record. He was informed by Airy Shaw (in litt., January 1983) that the record was based on a specimen held by the herbarium of the Royal Botanic Gardens, Kew, from the:

... vicinity of Lake Eyre. Coll. Mr Andrews. Comm. R. Schomburgk. Nov. 1875. No. 229.

and furthermore that:

This forms the sole basis of my attribution of *C. ephedroides* to S. Australia, but I have not studied the genus in detail. I believe the identification is correct..

Accordingly, Barker included *C. ephedroides* in the two subsequent South Australian censuses (Barker in Jessop 1983, 1984).

Weber (1986) included the species in the 4th edition of the *Flora of South Australia* as a synonym of the prior-named *C. paucifolius* (Klotzsch.)Baillon, stating that: "The existence of this species in S. Aust. is very doubtful".

C. paucifolius has continued to be questionably listed for the Lake Eyre region in South Australian censuses (Barker 1989, 1993, State Herbarium of South Australia 2001) until this time.

Forster (1995) stated that there were no records for South Australia and the species should be deleted for the state, but he had clearly not investigated the Andrews collection in Kew.

The Kew specimen

The process of compiling the most recent edition of the South Australian vascular plant census, published in

2005 (Barker et al. 2005), led the first author to contact the second, fortuitously spending time at Kew, to request him to investigate the specimen.

The specimen (Fig. 1) has a printed label with the text:

Vicinity of Lake Eyre, SOUTH AUSTRALIA. Coll. Mr Andrews. Com. R. Schomburgk. Nov. 1875^{*}.

to which has been added, in an unknown hand:

Euphorbia (*Calycopeplus*) sp. cf. *Euph. arborea* (Ephedra, Muell).

There is a separate paper tag glued to the sheet with the number 229. Again, the hand is unknown but there are similar number tags with other collections sent by Schomburgk from Adelaide so they are possibly numbers added to a set before despatch rather than collectors' numbers. There is nothing in the old 'Plant Lists' of collections submitted to Kew corresponding with Schomburgk's donation. There also appears to be nothing in the Schomburgk holdings of the State Herbarium of South Australia (AD) corresponding with this specimen, although these holdings have yet to be fully investigated.

The collector was probably Frederick William Andrews (1824?–1884), a collector and naturalist on the 1874 Lewis Expedition around Macumba River, Lake Eyre and Goyder Lagoon. He was employed by the South Australian Museum and is better known as a bird collector, but it is documented that he collected plants on occasion (Kraehenbuehl 1986). This is not certain however since there are two other collectors with surname Andrews who may have collected in South Australia in that period: J.H. Andrews who collected in 1883 and C. Andrews with date of collecting unknown.

Specimens examined

SOUTH AUSTRALIA. *C. Andrews* 121, s.dat. Lake Eyre. AD 99208028 (*Cyperus gracilis* R.Br.); *J.H. Andrews* 1180, 1883. Eyre Peninsula. AD 97737110 (J.G.O. Tepper Herbarium: *Waitzia acuminata* Steetz); *Mr Andrews* 229, s.dat. Vicinity

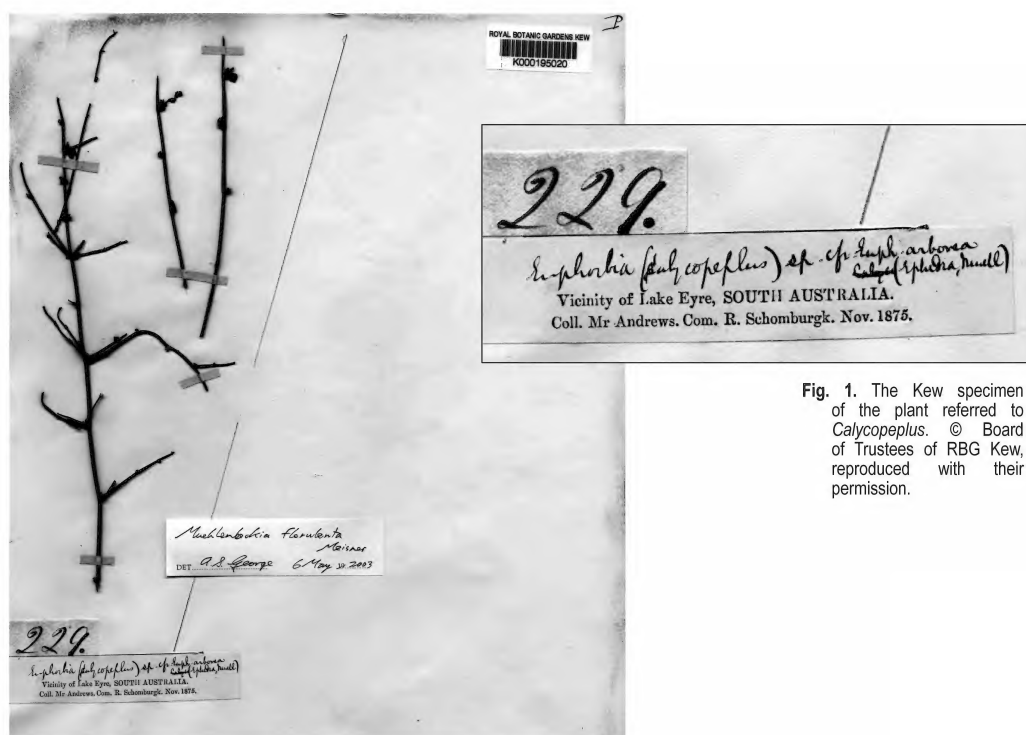


Fig. 1. The Kew specimen of the plant referred to *Calycoplepus*. © Board of Trustees of RBG Kew, reproduced with their permission.

of Lake Eyre. K ("com. R. Schomburgk Nov. 1875": *Muehlenbeckia ?florulenta* Meisner)

Identification of the specimen

Examination of the collection by George showed it to be a male specimen of a leafless *Muehlenbeckia* (Polygonaceae). It is probably the widespread *M. florulenta* Meisn. since one inflorescence is somewhat elongated, matching the description of this species (Chorney 1986), in contrast to the compact form in the related *M. coccoloboides* J.Black, but this determination remains tentative. There seems to be no reliable character for separating male specimens of these two species.

The name *Calycoplepus paucifolius* accordingly has been deleted from the South Australian flora. The species is endemic in Western Australia.

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A review of South Australian *Wurmbea* (Colchicaceae–Liliaceae): keys, new taxa and combinations, and notes

Robert J. Bates

State Herbarium of South Australia,
Hackney Road, Adelaide, South Australia 5000

Abstract

Wurmbea nilpinna R.J.Bates, a rare local endemic in the Davenport Range on Nilpinna Station in the Lake Eyre region of South Australia, and *W. dioica* ssp. *brevifolia* R.J.Bates, widespread in the wheat belt of south-eastern Australia, are described as new and illustrated. *W. citrina*, based on *W. dioica* ssp. *citrina* R.J.Bates, and *W. australism* based on *W. centralis* ssp. *australis* R.J.Bates, are raised to species level. A key is provided for all the South Australian species together with additional distribution records and other notes.

Introduction

Prior to 1980 only one species of *Wurmbea* was recognised for South Australia (e.g., Black 1943). This was *W. dioica* (R.Br.)F.Muell., known then as *Anguillaria dioica* R.Br.

Macfarlane (1980) reduced the Australian genus *Anguillaria* R. Br., the ‘early nancies’, to synonymy under *Wurmbea* and recognised four species from South Australia: *W. centralis* T.D.Macfarl., *W. dioica* ssp. *dioica*, *W. latifolia* T.D.Macfarl. and *W. uniflora* (R.Br.) T.D.Macfarl.

Bates (1995) increased the number of *Wurmbea* taxa in the state to twelve, nine species and three subspecies.

Curiously in 1995, just one week after publication of the aforementioned paper, the first South Australian *Wurmbea* examined by the author for identification proved to be a species not among those recognised there.

This present paper increases the number of recognised taxa of *Wurmbea* in South Australia to 15 (or 15 times the number recognised in 1975 and almost 4 times the number in Macfarlane’s 1980 revision!)

Some workers would recognise even more taxa (e.g., D.L. Jones, pers comm. 2001), but the author has remained conservative here. All taxa discussed have been studied throughout their range during field studies by the author over twenty years.

Key to the South Australian species of *Wurmbea*

- 1: Lower leaves basal paired or almost opposite, of similar shape and size 2
Lower leaves well separated, usually of different shape and size 4
- 2: Lower leaves with serrated margins; flowers unisexual; nectaries one per tepal as a single band of colour
..... *W. latifolia*
Lower leaves with smooth margins; flowers hermaphrodite; nectaries 2 per tepal 3

- 3: Lower leaves narrow, linear, decumbent; flower single, less than 7 mm across; capsule elongate on a decumbent stem *W. decumbens*
Lower leaves broadly linear-lanceolate, not decumbent; flowers usually several, greater than 7 mm across; capsule ovoid on an erect stem *W. australis*
- 4: Nectary one per tepal, either central or as a single band of colour 5
Nectaries two per tepal 7
- 5: Nectary pitted, in centre of tepal, not forming a band; flowers hermaphrodite *W. nilpinna*
Nectary not pitted, a continuous band of colour; flowers unisexual 6
- 6: Flowers bright yellow; tepals fleshy, obtuse; nectary yellow brown *W. citrina*
Flowers white or pink; tepals not fleshy, acute; nectary usually purple *W. dioica*
- 7: Flower usually single, tepals less than 3mm broad 8
Flowers usually several, tepals broader than 3mm 10
- 8: Flower greater than 10 mm across, tepals not clasping the filament, tepal margins violet or bright purple-pink, elongate, outer margin of nectary not winged, growing in semi arid areas *W. stellata*
Flower less than 10 mm across; tepals clasping the filament (at least in living plants), without colourful edging, outer margin of nectary appearing winged, growing in mostly coastal areas 9
- 9: Basal leaf linear-lanceolate; nectary receptacle thickened; anthers yellow, spring flowered plants of high rainfall areas *W. uniflora*
Basal leaf filiform; nectary receptacle not thickened; anthers purple, restricted to the west coast *W. sinora*
- 10: Tepals forming a cup shaped tube; nectaries small, elliptical with margins elevated all round; base of styles connate
..... *W. deserticola*
Tepals not forming a tube; nectaries large, not elliptical, without elevated margins; base of styles not connate 11
- 11: Flowers crowded; nectaries semi-oval; desert plants from mountains of the North West *W. centralis*
Flowers well spaced; nectaries like broad ledges; mountain plants of the Flinders Ranges and Northern Lofties
..... *W. biglandulosa*

W. nilpinna* R.J.Bates**W. nilpinna* R.J.Bates, sp. nov.**

A Wurmbiae speciebus aliis statura maxima, nectario singulare marsupiforme in quoque tepalo, marginibus roseis tepalorum, ramis purpureis differt. Fig. 1.

Typus. South Australia, Lake Eyre region, Davenport Range, Nilpinna Station, 15.viii.1993, F.J. Badman 7107; (holo.: AD; iso.: AD).

Description

Perennial lily, sprouting only after heavy cool season rain from an ovoid corm to 3 cm diam, encased in shining, hard, hyaline sheaths. *Plants* to 20 cm tall, with fleshy purplish stems to 3mm diam. *Leaves* three, the lowest linear-lanceolate, falcate, to 15 cm long and 5 mm wide, with a leathery texture; middle leaf similar but shorter and with an inflated base, set 3-4 cm above the lowest leaf; upper leaf just below the inflorescence, ovoid, bract-like, 2-3 cm long. *Flowers* on erect peduncle, 1-5, white with pink edging, about 2 cm across, rigid, in a short spike, hermaphroditic, not fragrant. *Perianth* star-like, tepals uniform, narrow lanceolate, sub-acute, 8-10 mm x 3-4 mm, opening widely and almost free from the base with incurved tips, white with pink edges. *Nectary* a distinctive pink 'pocket' in the middle of each tepal. *Filaments* 6; free from the base, 3-5mm long with

a broad base tapering to an acute apex; anthers ovoid, medifixed, tremulous, purple-red, about 2 mm long. *Ovary* tripartite, ovoid, red; styles three, half as long as the stamens. *Capsule* box-like, enlarging to 25 mm long, dehiscence apical-loculicidal. *Seeds* not seen.

Flowering

June to September, depending on rainfall (not an annual event).

Distribution and ecology

Known only from rock slopes in fertile red clays, on the eroding edges of a large barrow-like mound of red clay over archaic rocks, known as the Davenport Range.

Distinguishing features

Although superficially similar to other large arid-land species such as *W. deserticola* and *W. centralis*, the single pocket-like medifixed nectary on each tepal allows instant recognition. The pink tepal margins and purple stems also are good diagnostic features. *W. nilpinna* also flowers later than other *Wurmbea* of the north.

Variation. Very little variation shown except in flower size.

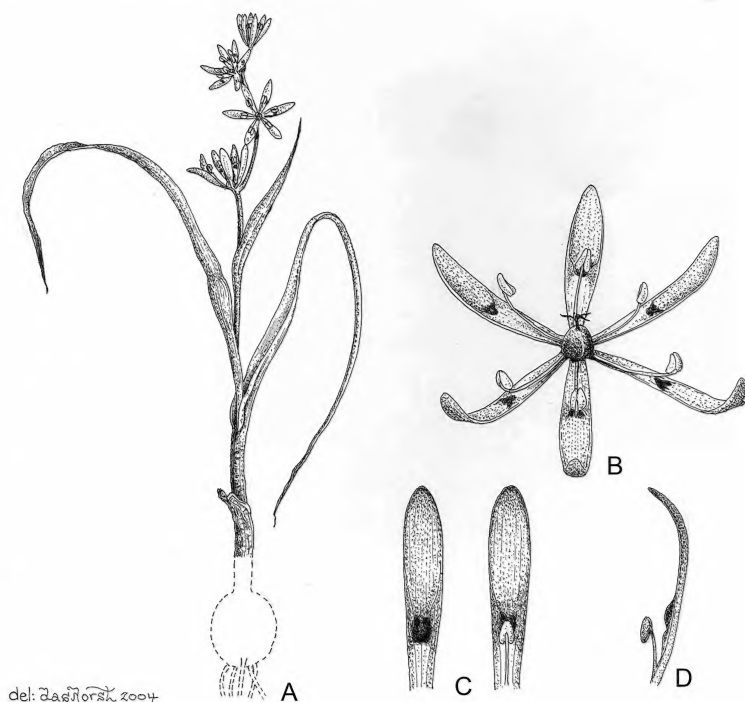


Fig. 1. *W. nilpinna* R.Bates. A, whole plant $\times 0.75$; B, open flower $\times 3.75$; C, tepals showing single pouted nectary $\times 6.75$; D, tepal in side view showing almost free stamen $\times 6.75$. (Based on Badman 7107).

History

The species was discovered at the type location by botanist and ornithologist Frank Badman while working on Nilpinna in 1993. It was eight years before suitable rains made it worth revisiting the area.

Sympatric species

Although *W. citrina* occurs on sandy flats 20 km west of the Davenport range no other wurmbeas are known from the range itself, although it is likely that *W. stellata* would appear after heavy autumn rains. It is not unlikely that further undescribed wurmbeas occur in the jumble of rocky ranges interspersed with gullies, sandhills, ephemeral creeklines and claypans in this area of very diverse geology occurring between Nilpinna and Lake Eyre.

Etymology. 'Nilpinna' is the name of Aboriginal origin, given to the large station property of which the Davenport Range is just one outstanding feature.

Conservation status

The Davenport Range is not conserved. The species has a total distribution within just 10 km × 1 km of this fast eroding relict feature and the area is grazed by cattle and wild donkeys, and (P. Jacobs, pers. comm. August 2001) has been grazed for a hundred years. The plants, however, are not under any immediate threat as they seem to be unpalatable to stock and appear only after rare rainfall events which ensure that there is always an abundance of other feed when *W. nilpinna* blooms. Not one plant showed any sign of browsing or insect damage during my investigations in the wet winter of 2001.

Other specimens examined

SOUTH AUSTRALIA. LAKE EYRE REGION: Davenport Range, 4km north west of Mt. Margaret on rocky edges of plateau, 15.viii. 2001, *R. Bates 59482*, AD (live plants also sent to D.L. Jones, Australian National Botanic Gardens); 10km south east of Nilpinna Homestead, 14.viii.2001, *R. Bates 59293*, AD.

The *W. dioica* (R.Br.) F. Muell. complex in South Australia

Members of this complex are all dioecious, with well-spaced leaves and the nectary as a single band of colour across the centre of each tepal. Flower colour varies from bright citrine, to pink, white or cream. Habitat ranges from coastal waterholes, to woodland, rock outcrops, shores of inland salt lakes and even red desert sand dunes. The discovery that some of the many different forms occur sympatrically but do not intergrade suggests that they are distinct taxa, dependent on distinctions being retained throughout the range of distribution.

The types of *W. dioica* at the Natural History Museum, London (BM) are from Port Jackson (Sydney, New South Wales) and were collected by Robert Brown (Brown 1810). Plants seen by the author in the Sydney region had white flowers with pale nectaries and a long upper leaf. This is the common form throughout

higher rainfall coastal areas from southern Queensland, throughout south-eastern Australia and Tasmania as far west as Adelaide.

Bates (1995) described two new subspecies of this ubiquitous group, *W. dioica* ssp. *citrina* and *W. dioica* ssp. *lacunaria*, and discussed the possibility that other forms would later be described and named. Bates (2005) provided one of these the phrase-name. Following a revised key to the complex, this last taxon is described and named and *W. dioica* ssp. *citrina* is raised to species level.

Key to the *W. dioica* complex in South Australia

- 1: Flowers bright yellow-green; tepals fleshy *W. citrina*
 Flowers not bright yellow-green; tepals not fleshy 2
 2: Upper leaf short; female flowers often pink edged
 *W. dioica* ssp. *brevifolia*
 Upper leaf with a long filiform apex; flowers not pink
 edged 3
 3: Tall semi-aquatic plants, with most of upper leaf filiform
 *W. dioica* ssp. *lacunaria*
 Short plants of non aquatic sites, with only upper half of
 leaf filiform *W. dioica* ssp. *dioica*

Wurmbea dioica ssp. *brevifolia* R.J.Bates, ssp. nov.

A subspeciebus aliis folio supermo brevior, floribus erubescens aetate proecta, plantisque sexualiter dimorphioribus i.e. plantae masculinae grandiores et nectaria coloratiores quam feminae differt. Fig. 2.

Typus. South Australia, Flinders Ranges: 24 km north of Hawker, 10.viii.1963, *N.N. Donner* 844 (holo: AD; iso AD: the collection includes both male and female plants).

W. dioica ssp. *Short upper leaf* (S. Williams CPB23): R.J. Bates in W.R. Barker et al. Census S. Austral. Vasc. Pl. (2005) 161.

W. dioica (R.Br.) F. Muell.: T.D. Macfarl., Fl. S. Austral. 1772 (1986), partly.

Description

Plants dioecious, to 20 cm tall, often dimorphic; the female plants usually smaller in all parts and turning pink with age. *Leaves* three, alternate, the lowest leaf linear-lanceolate, elongate, to 15 cm long and 5 mm wide, erect; middle leaf similar or shorter and with an inflated base; upper leaf just below the inflorescence, somewhat ovate and swollen to 1-2 cm long, as wide as long, its apex obtuse or acute, not elongated as in the other leaves. *Flowers* 1-6, male flowers about 2 cm across, white or cream, female flowers to 1 cm across, often turning pink with age; the tepals more rounded; nectary a single continuous horizontal band of purple about 2 mm across, set less than half way up each tepal; *stamens* on male plants only, adnate to tepals only at the base, white, to 6 mm long, the anther purple; *ovary* ovoid, often turning purple.

Flowering

Mostly in winter, from June to early September. Flowers long-lived, the female plants beginning to flower earlier and finishing before the males. The

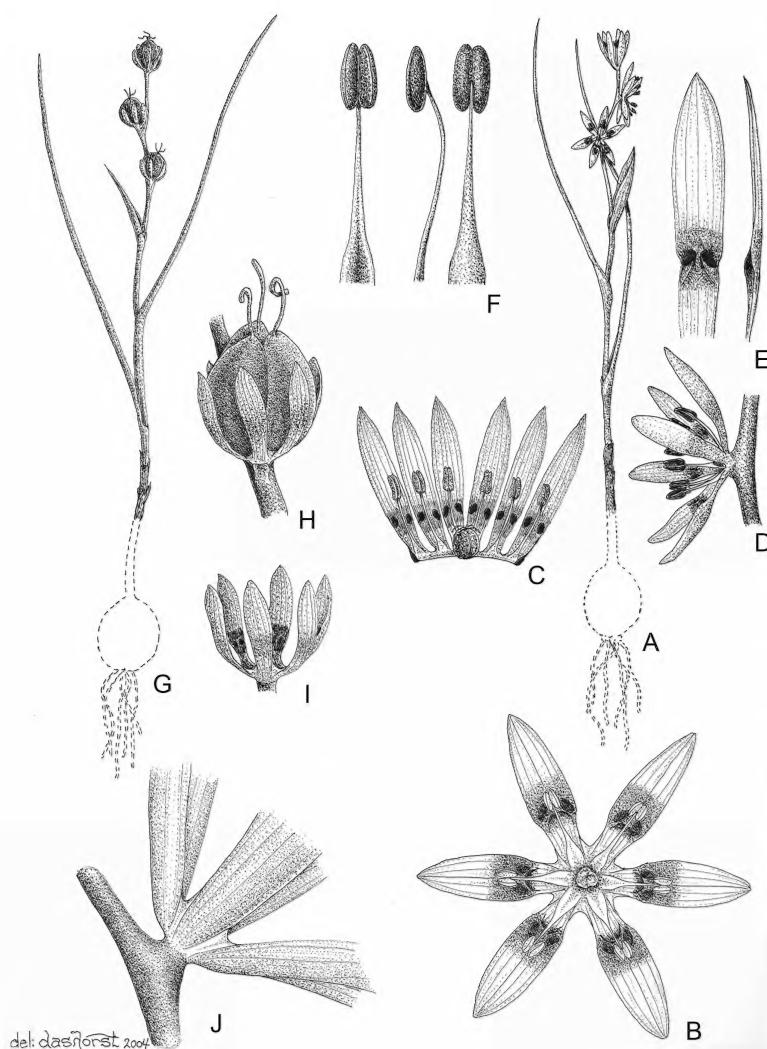


Fig. 2. *W. dioica* ssp. *brevifolia* R. Bates. A - F, male plant: A, whole plant $\times 0.9$; B, male flower in surface view $\times 7.5$; C, opened male flower $\times 6$; D, male flower in side view $\times 6$; E, tepal in surface and side view $\times 11.25$; F, stamens in front, back and side view $\times 18.8$; G - J, female plant: G, whole plant $\times 0.9$; H, flower after anthesis $\times 5.25$; I, flower showing cupped appearance $\times 5.25$; J, base of tepals $\times 7.5$. (Based on R. J. Bates 25641).

subspecies flowers earlier than ssp. *dioica* where the two grow together.

Distribution and habitat

This is the most widespread subspecies in South Australia, extending from the coast to well inland, especially common in the Flinders Ranges and on Eyre

Peninsula. The species occurs from the state's western border to its eastern border. It is found in drier sites than ssp. *dioica*, from coastal limestone and mallee, to mountain tops in the Flinders Ranges and rock outcrops in the southern pastoral zone. The species is likely to extend to the drier inland parts of New South Wales and Victoria.

Sympatric species

Often found with *W. latifolia* ssp. *vanessae* near the coast, sometimes with *W. dioica* ssp. *dioica* in drier hills. Further inland, in the Gawler Ranges, the subspecies is found with *W. australis* and rarely with *W. citrina* and *W. stellata*. In the Flinders Ranges it often occurs with or near *W. biglandulosa* and *W. australis*.

This taxon does not intergrade with any other taxa except for *W. dioica* ssp. *dioica* itself, mostly in the state's South-east.

Distinguishing features

Differs from all other subspecies of *W. dioica* in its short upper leaf, more sexually dimorphic plants, the female plants being smaller than males with less colorful nectaries; flowers turning pink with age, nectaries deep purple on male flowers.

In comparison with *Wurmbea* taxa overall, these attributes set *W. dioica* ssp. *brevifolia* apart from most other species and subspecies. The well separated, smooth-edged leaves separate it from *W. latifolia*, the short upper leaf additionally separates it from ssp. *dioica* and ssp. *lacunaria* of *W. dioica*, and the white or pink flowers set it apart from *W. citrina*. Through its cream flowers *W. dioica* ssp. *brevifolia* has in the past been confused with *W. citrina* but its reduced succulence, paler flowers, purple nectaries and different rocky, inland habitat separate the two taxa.

Variation

This is a variable taxon, not just because of its sexually dimorphic nature but because there are several loose geographic races which include a small slender purplish form from parts of the Gawler Ranges, a more robust cream flowered form from the Flinders and Barrier Ranges and the more common white-flowered form from the southern parts of the state. All are consistent however in their short upper leaf. DNA studies are required to sort these races.

Etymology

From Latin *brevis* short and *folia* a leaf, the name suggested by the comparatively short upper leaf of the subspecies.

Conservation status. Common and widespread.

Selected collections seen (from c.50 at AD).

SOUTH AUSTRALIA. NULLARBOR REGION: 78km E of the WA/SA border by the Eyre Highway, 8.viii.1989, *E.M. James* 80. FLINDERS RANGES REGION: Orparinna Nat. Park, 14.ix.1971, *D.E. Symon* 7342 (cream colored form). EASTERN REGION: Morialpa Station, 11.vii.1995, *R. Bates* 41600 (with white flowers and purple nectaries). EYRE PENINSULA REGION: 15km west of Caroona (Koorinja) Hill, June 1991, *R. Bates* 25516 (stems purple, filiform, upper two leaves close under the pink flowers); South of Port Neill on section 669 Hundred of Dixon, 19.viii.1965, *C.R. Alcock* 669. Yorke Peninsula region: inland from Daly Head, 27.viii.1976, *B. Copley* 4971. MURRAY REGION: 17km from Swan Reach, section 33, Hundred of Fisher, 12.viii.1995, *B.M. Overton s.n.* (contains good

examples showing marked sexual dimorphism). SOUTHERN LOFTY REGION: Port Elliott, on limestone, 28.viii.1967, *T. Smith* 43; Belvidere Scrubs, 6.viii.2000, *R. Bates* 57180 (has the top leaf only one tenth the length of the middle leaf!) SOUTH-EASTERN REGION: Potters Scrub, Coorong, 8.vii.2003, *R. Bates* 60972.

W. citrina (R.J.Bates) R.J.Bates, *comb. & stat. nov.*

Basionym: *Wurmbea dioica* ssp. *citrina* R.J.Bates, *J. Adelaide Bot. Gard.* 16: 45 (1995). **Typus:** South Australia, Lake Eyre South, in low sand-hills, 9.vi.1978, *F.J. Badman* 61 (holo.: AD).

W. dioica (R.Br.) F.Muell.: T.D.Macfarl., *Fl. S. Austral.* 1772 (1986), partly.

Description: see Bates (1995).

Notes

Further field studies since 1995 have shown that *W. citrina* is a very constant taxon, restricted to red sandy desert soils and with a discrete range. This range is mostly to the north of that of *W. dioica* but for a few locations where the two occur as adjacent populations. Where side by side, no introgression occurs. *W. dioica* does not grow on red desert sands. Differences in morphology further to those given in Bates (1995: as indicated in the above key) have been noted, not the least being the sexual dimorphism exhibited by *W. citrina*. Male plants have many more (up to 20), longer-lived flowers, in a loose flexuose spike. The author (Bates 1995) stated incorrectly that male plants of *W. citrina* had less flowers than female plants.

Distribution

W. citrina is considerably more common and widespread than previously thought, where the great majority of collections were known from the sandy desert regions of South Australia (Bates 1995). It extends to the west into the state's North-western region and across the Great Victoria Desert and to the east into the western border districts of New South Wales.

Variation

Most variation in size is due to seasonal conditions. As for other desert species flowering does not occur every year but only in years with heavy autumn or early winter rains.

Notes on other subspecies of *W. dioica* in South Australia*W. dioica* ssp. *dioica*

The known distribution of a reconstituted *W. dioica* ssp. *dioica* is now much reduced in South Australia. The distribution shown in Bates (1995) included a collection purportedly from the North-western region but this was based on incorrect collection details.

W. dioica ssp. *dioica* does not occur north of about Clare, in the state's Northern Lofy region, or west of Gulf St Vincent, preferring higher rainfall districts and avoiding calcareous soils.

***W. dioica* ssp. *lacunaria* R.J.Bates**

Only two collections have been made from South Australia, both from the edge of vernal waterholes, the most recent from Penola Conservation Park where it is said to be extremely rare (K. Alcock, pers. comm. November 2003).

Specimens examined

SOUTH AUSTRALIA. SOUTH-EASTERN REGION: Penola Conservation Park, R.J. Bates 61517, 11.xi.2003, AD.

***W. centralis* T.D.Macfarl. and
W. australis (R.J.Bates) R.J.Bates*****W. australis* (R.J.Bates) R.J.Bates, comb. & stat. nov.**

Basionym: *W. centralis* ssp. *australis* R.J.Bates, J. Adelaide Bot. Gdn. 16: 39 (1995), non *Anguillaria australis* F. Muell., Fragm. Phyt. Austral. 10: 119 (1877).

Typus: South Australia, Siam station, Gawler Ranges (EP), on rocky hills of granite porphyry, 11.vii.1991, R. Bates 25633 (holo.:AD).

Anguillaria dioica R.Br.: J.M.Black, Fl. S. Austral. 1: 187 (1943), partly.

W. centralis T.D.Macfarl., Fl. S. Austral. 1772 (1986), partly.

Description: see Bates (1995).

Notes

Continuing studies of populations of both *W. centralis* and *W. australis* throughout their range have shown that the two are very distinct in morphology and distribution, and are probably not closely related.

Their ranges are separated by over 500 km of desert. *W. centralis* a relict species known from only four sites in Central Australia, the largest two populations both at Katajuta. Bates (1995) recorded it also further south, based on Helms's collection from WaWee Waterhole, a location which is actually in South Australia, not Western Australia as previously indicated. The species is tall, with well separated, erect, channeled leaves and crowded flowers with rounded tepals.

By contrast *W. australis* is a common and widespread species throughout the southern pastoral zone of South Australia. It is generally short in stature with the lowest leaves paired, hardly channeled and not very erect, and the flowers well spaced with pointed tepals.

The nectaries of both species are similar but those of *W. australis* are larger, deeper and closer to the base of the tepal.

W. australis is probably more closely related to the small, single flowered, also South Australian endemic, *W. decumbens* which also has paired basal leaves (Macfarlane 1980).

The author gave some consideration to using a different specific epithet because of the existence of the illegitimate collective name '*Anguillaria australis*' F. Muell. (1877). However there is no likelihood of the genus *Anguillaria* being resurrected for Australian plants, as there seem to be no characters separating

South African species as a whole from the Australian ones as a whole.

Variation

There appear to be two races within *W. australis*, which warrant further study. A large form with broad fleshy leaves occupies granite outcrops such as in the Gawler Ranges, at Plumbago and in the northern Flinders Ranges, while a smaller form from the southern Flinders Ranges on quartzite.

Sympatric species

Over its wide range *W. australis* occurs with many other species, *W. biglandulosa* in the southern Flinders, *W. stellata* in the Gawler Ranges, *W. dioica* ssp. *brevifolia* through much of its 'non desert' range, *W. citrina* wherever exposed granite occurs adjacent to red sand hills, and *W. latifolia* ssp. *vanessae* near Melrose in the southern Flinders. There is no evidence of intergradation.

Notes on other South Australian species***W. biglandulosa* ssp. *flindersica* R.J.Bates**

Consideration was given to raising this taxon to species level but the discovery of intermediate forms between ssp. *biglandulosa* and ssp. *flindersica* has deemed this inappropriate. One example is a white flowered population in the grasslands of the midnorth of South Australia.

Specimen examined of intergrade

SOUTH AUSTRALIA. NORTHERN LOFTY REGION. North Bungaree, viii.1992, R. Bates 28980, AD.

***W. deserticola* T.D.Macfarl.**

The number of collections in South Australia has tripled since 1995, including a collection *Badman 1085* from the Great Victoria Desert over 200 km from the normal range of the species in the state's far North-West.

Macfarlane (1980) has already noted the two very different sand-hill and rocky slope habitats favoured by the species, with a common feature being the presence of *Triodia* hummocks.

W. deserticola in the ranges of Central Australia flowers freely only after fire. Observations were made on the margins of burned areas in the region. Plants in unburned sections were reduced to a single poor leaf while only a few metres away in areas burned six months earlier, plants were full size, most with up to a dozen flowers.

Specimen cited:

SOUTH AUSTRALIA. NORTH-WESTERN REGION. 8 km NE of Garford Outstation, Commonwealth Hill, in red sand, 14.vii.2000, F.J. Badman 1085, AD.

***W. stellata* R.J.Bates**

Searches for this species since 1995 have shown it to be common and widespread throughout rocky parts of the South Australian deserts, but appearing only in wet years.

***W. uniflora* (R. Br.) Benth.**

The author (1995) stated that this species, occurring in Victoria and Tasmania was 'Probably extinct in the Mt Lofty Ranges', having not been seen there for over a hundred years. However in 1996 the collection *Spooner 16208* was made near Mount Bold, south east of Adelaide by members of the South Australian Field Naturalists Society. Since then another population (*Bates 67321*) has been found in damp grassy messmate woodland a few kilometers away. Nevertheless the species is endangered in South Australia, being known from less than 200 plants.

Specimens cited

SOUTH AUSTRALIA. SOUTHERN LOFTY REGION: Thomas Creek Track, Mount Bold Reservoir, se side, 17.xi.1996, A.G. Spooner 16208, AD; Mt Bold Reservoir, 20.xi.2005, R.J. Bates 67321, AD.

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I wish to thank the staff and associates at the State Herbarium, particularly to Gilbert Dashorst for the illustrations and Hellmut Toelken for the Latin diagnoses. Thanks also to Susan, Sonya and Sandy for companionship on field trips.

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PO Box 2732
Kent Town SA 5071
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Australian Plant Census Precursor Papers 1

Introduction to the series

A.E. Orchard

^aAustralian National Herbarium, Centre for Plant Biodiversity Research,
G.P.O. Box 1600, Canberra ACT 2601¹

The Australian Plant Census (APC) is an ongoing national cooperative project to produce a consensus list of the vascular flora of Australia with synonyms reflecting past taxonomic concepts.

Origins of the Australian Plant Census

Until now plant census lists in Australia have mainly been compiled and maintained on a State or Territory basis, with, at most, limited and regional synonymy. The last national plant census was that of Hnatiuk (1990), and the ones before that were by Mueller (1882, 1889).

Since 1991 Australia has also been fortunate to have available the Australian Plant Name Index (APNI), at first as a printed work (Chapman 1991) and later as a website (Australian National Herbarium et al. 2004).

APNI provides a comprehensive view of the major literature of Australian vascular plant taxonomy associated with the Australian flora, with information on places of publication of names, indications of synonymy in papers by the original and secondary authors, type citations and some notes on nomenclature. What it has not provided are value judgements on the names listed. There was little or no information presented on which were accepted names and which were synonyms, and little on alternative taxonomies.

It was left to users to access the botanical literature, censuses and other works, and to develop their own view of currently accepted names and their synonyms. While APNI provided some information on distribution, this was derived from the tables in Hnatiuk (1990), derived from sources such as state censuses, floras and monographs. These data are now frequently out of date.

In the late 1990s and into the early 2000s, individuals, institutions and organisations decided to work together to try to produce a single consensus view of the accepted names for the Australian vascular flora based on the APNI, State and Territory censuses and Floras, taxonomic monographs and revisions, and expert advice. It was not intended that this view should be formally binding: its use by any individual or organisation was to be purely optional. It was intended that, through this collaborative approach, it would

- have the immediate and ongoing support of the majority of the Australian taxonomic community as a day-to-day working list,
- so far as possible in the Australian context, provide full synonymies
- provide an indication for accepted taxa of their distribution in Australia and Territories at least to State level
- reflect, at least in overview, alternative taxonomies, and
- provide commentary on nomenclatural complexities and other related matters.

This list, which became known as the Australian Plant Census, was to be available electronically as a searchable database built on APNI as a bibliographic and nomenclatural source. In effect, it was to provide a view of the APNI data, reorganised as formal synonymies, with recommended name usages, and seamless links from the synonymies to the underlying literature resources.

A major driver of the Australian Plant Census was a growing perception of need for a single agreed view

¹ Now P.O. Box 3427, Weston Creek ACT 2611

of the Australian flora for users of flora information; the single view of birds provided by the RAOU Bird Lists (Barrett et al. 2003), for example, had long proved beneficial in publications and other communication, with taxonomic controversy able to go on behind the scenes unconstrained by the need to consider impact on the broader user. A catalyst was the development of Council of Heads of Australasian Herbaria (CHAH)'s vision of the Australia's Virtual Herbarium; the concept provided funding for capture of the nation's 6 million specimens housed in the principle herbaria across the continent.

The Australian Plant Census project

In 2005 CHAH, as lead organisation for production and maintenance of the APC, obtained a grant from the Natural Heritage Trust for a two-year pilot project to compile the 'first pass' of the APC. A Project Officer (AEO) was appointed as the project's Coordinator, based at the Australian National Herbarium, which hosts and provides a team servicing the APNI database (Table 1). CHAH provided substantial additional support, with each member herbarium providing unlimited access to one of their staff as a member of an APC Working Group. Backup staff members were also nominated to the Working Group.

The normal operating procedure is for the Coordinator to draft initial synonymies family-by-family. The drafts are circulated to the Working Group who consult with colleagues. Comments and changes resulting from this consultation are incorporated in the family lists, which are then circulated to CHAH for final approval. Additional funding has been provided by CHAH and private sources to support entry of the agreed family classification into the APNI database.

The project began in April 2005, and the first pass initial compilation encompassing the vascular flora including its major synonymy and distributional data, is scheduled to be completed in April 2007. By that time it is expected that a 'first pass' census of the Australian vascular flora, with its major synonymy and distributional data, will be completed. Plans will also be developed for its further development, including searching of secondary literature for additional synonyms, further entry of alternative taxonomies, and extension to other plant groups, and for its on-going maintenance.

Further information on the project, including updates on progress, and website addresses to access the data, can be found in West (2005), Council of Heads of Australasian Herbaria (2006), and Orchard (2005a, b, c, 2006a, b).

The Australian Plant Census precursor papers

This is the first in a series of papers addressing minor nomenclatural problems encountered during compilation of the Australian Plant Census. These papers will be

Table 1. Personnel and insitutional representation in the Australian Plant Census project. Modified from Council of Heads of Australasian Herbaria (2006).

Personnel	Institution
<i>Project Coordinator</i>	
A.E. Orchard (2005–06)	Australian National Herbarium (CANB) (employed through Northern Territory Herbarium)
A. Monro (2006–)	Australian National Herbarium (CANB)
<i>Working Group members (backup)</i>	
Robyn Barker (Helen Vonow) 2005–	State Herbarium of South Australia (AD)
Ailsa Holland (Peter Bostock) 2005–	Queensland Herbarium (BRI)
Brendan Lepschi (Kirsten Cowley) 2005–	Australian National Herbarium (CANB)
Dale Dixon 2005–	Herbarium of the Northern Territory (DNA_)
Ian Cowie 2006–	
Philip Short 2006–	
Alex Buchanan (Marco Duretto) 2005–	Tasmanian Herbarium (HO)
Neville Walsh (Val Stajsic) 2005–	National Herbarium of Victoria (MEL)
Peter Wilson (Joy Everett) (2005–)	National Herbarium of New South Wales (NSW)
Terry Macfarlane (Cheryl Parker) 2005–	Western Australian Herbarium (PERTH)
<i>Council of Heads of Australasian Herbaria approval</i>	
Bill Barker 2005–	State Herbarium of South Australia (AD)
Gordon Guymer 2005–	Queensland Herbarium (BRI)
Judy West 2005–	Australian National Herbarium (CANB)
Greg Leach 2005–	Herbarium of the Northern Territory (DNA_)
Dale Dixon 2005–06	
Gintaras Kantvilas 2005–	Tasmanian Herbarium (HO)
Jim Ross 2005	National Herbarium of Victoria (MEL)
Teresa Lebel 2006	
David Cantrill 2006–	
Brett Summerell 2005–	National Herbarium of New South Wales (NSW)
Neville Marchant 2005	Western Australian Herbarium (PERTH)
Nick Lander 2006	
Kevin Thiele 2006–	
<i>Information management</i>	
Bronwyn Collins 2006–	Australian National Herbarium (CANB)
Kirsten Cowley 2005–	
Jim Croft 2005–	
Murray Fagg 2005–	
Brendan Lepschi 2005–	
Anna Monro 2005–	
Greg Whitbread 2005–	
<i>Specialist taxonomic advice</i>	
See APC website	< www.chah.gov.au/chah/apc/contributors.html >

restricted to short communications about such matters as lectotypification and necessary recombinations and short discussions of nomenclatural problems. Longer papers will be published separately.

The format will be an umbrella-type heading, followed by self-contained short papers each with its own author(s). These papers should be cited as follows in the way the first paper in the series is cited here:

Orchard, A.E., George, A.S. & Brummitt, R.K., (2007) Australian Plant Census precursor papers I: Publication and lectotypification of the name *Stenocarpus sinuatus* (Proteaceae). *J. Adelaide Bot. Gard.* 21: 85–87.

Different Australian herbarium house journals may be used for publication of the series from time to time, depending on publication schedules.

Acknowledgements

Apart from acknowledging the hard work contributed by the State-based members of Working Group, CHAH, and the Information Management Group (listed in the table above) I would like to place on record my sincere thanks to all those other colleagues who have contributed data and encouragement to this project. To date the census has truly been a national effort, and one which demonstrates the collegiality of Australian plant taxonomy, and it shows every sign of continuing thus. In particular I wish to thank Bill Barker and Jim Croft, both for keeping me focused on the project, and for very useful suggestions to improve this overview.

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Publication and lectotypification of the name *Stenocarpus sinuatus* (Proteaceae)

A.E. Orchard^a, A.S. George^b & R.K. Brummitt^c

^aAustralian National Herbarium, Centre for Plant Biodiversity Research,
G.P.O. Box 1600, Canberra ACT 2601²

^b‘Four Gables’, 18 Barclay Rd, Kardinya WA 6163

^cHerbarium, Royal Botanic Gardens, Kew, Richmond, Surrey TW9 3AB, England, UK

The Firewheel Tree or Yiel-yiel is well known in cultivation and as a street tree, and admired for both its glossy dark green foliage and its spectacular radiating umbels of red and yellow flowers.

Most recent references (e.g. Foreman 1995; Henderson 2002) give its name as *Stenocarpus sinuatus* (Loudon) Endl., following Chapman (1991). Exceptionally Stanley & Ross (1986) and Harden (2002) cite the name as *Stenocarpus sinuatus* Endl.

The species epithet was first published by Loudon (1832), who utilised an Allan Cunningham manuscript name ‘*Agnostus sinuatus*’ in a list of plants growing

in England. Loudon pointed out that Cunningham’s generic name meant “unknown; provisional name”. However, Loudon accepted it, so it was not a nomen provisorium, but he did not provide a validating description. In the table of properties accompanying the list were symbols meaning “Evergreen tree”, “15 feet”, “ornamental” and “greenhouse”. The tabular format of Loudon’s publication is comparable with that of Sweet’s *Hortus Britannicus* which is ruled in Ex. 3 of Art. 32 as not providing validating descriptions. The generic-specific combination is thus a nomen nudum and invalidly published. There was a note accompanying

² Now P.O. Box 3427, Weston Creek ACT 2611

Loudon's listing of '*Agnostus sinuatus*': "This is the plant compared to an oak in the late notice of *Kew Garden, Gard. mag.* vol. vii p.687". This note does not provide a validating description, for two reasons. Firstly, the note referred to, in discussing Cunningham's collections, merely states "...another which may turn out a *Quercus*." Secondly, the last sentence of Art. 42.1 precludes using an earlier description or diagnosis to validate a descriptio generico-specifica.

So when was *Stenocarpus sinuatus* validated? In 1830 Brown described a quite different plant as *Stenocarpus cunninghamii* R.Br., and this name is still applied to a plant of Western Australia and the Northern Territory. Hooker (1846) described another plant as *Stenocarpus cunninghamii* Hook. and gave *Agnostus sinuatus* as a synonym. So *Agnostus sinuatus* was still invalid in this publication (Art. 34.1 (a)) and *Stenocarpus cunninghamii* Hook. was illegitimate (Art. 53.1). Endlicher (1848) accepted the name *Stenocarpus sinuatus* and referred back to Hooker's description of *Stenocarpus cunninghamii* Hook. Thus *Stenocarpus sinuatus* is validated in Endlicher and its type must be that on which Hooker based his description. Hooker mentioned several specimens on which his description was based, and also provided a diagnostic plate. A lectotype should be chosen from among these. The correct citation of the name of this species is *Stenocarpus sinuatus* Endl. (1848).

Lectotypification

Hooker (1846) was very specific about the sources of his material. It had its origin in plants collected by Allan Cunningham in 1828 along the Brisbane River, Moreton Bay. These specimens were sterile and Cunningham was not sure what they were. He sent two rooted plants to England to "Mr Smith" who propagated a number of others from them. He also sent dried material to Robert Heward. In the meantime "T.Bidwill" [?J.C.Bidwill] had sent fruits (without seeds) to Hooker in 1843, and these were shown to Cunningham, who determined them as *Stenocarpus*. In August 1847 Hooker received from Messrs. Weeks and Day, from the greenhouse of the 'United Gardeners' Society', King's Road, Chelsea 'fine flowering specimens'. From these the plate in the *Botanical Magazine* was prepared, and the extensive validating description. Hooker noted that while the paper was in press he heard of additional flowering specimens in Edinburgh Botanic Garden (specimen received per Dr. Balfour) and at the Birmingham Botanic Garden per Mr Cameron (no specimen mentioned). Neither of these last two can be considered as providing potential syntypes, as they were received after preparation of the description.

As Cunningham's collections are sterile, and because Hooker described flowers and fruits, they are not ideal choices as lectotypes. Hooker's description is fulsome on flower characters, and thus the Weeks and Day specimen is the prime candidate for lectotype. Hooker

also described the fruit, obviously on the evidence of the Bidwill collection, and this should also be considered a syntype.

Only one specimen derived from cultivated material survives in Hooker's Herbarium in Kew. It is flowering, and bears the following annotations: 'Cult.' 'S.sinuatus Endl. V. 539', with a printed label 'FLORA AUSTRALIENSIS named by Mr. Bentham.', another 'S. sinuatus Endl.! *Stenocarpus Cunninghamii* Hook. non Br. Bot. Mag. tab. 4263 1847 t.7', a faint pencil annotation that seems to read 'Fl. des Serres' [ie referring to a dry glasshouse], and a 'Herbarium Hookerianum' stamp. This specimen is here designated as lectotype of *Stenocarpus sinuatus* Endl.

Two Cunningham collections from Moreton Bay survive, both sterile, and these should be considered to be residual syntypes. One is in Kew Herbarium (K), one in the Natural History Museum (BM).

The Kew specimen is annotated '5. *Stenocarpus sinuatus* Endl. D.C.XIX 451 *Stenocarpus Cunninghamii* Hook. Bot. Mag. t. 4263 (non R.Br.) *Agnostus sinuatus* A.Cunn. Brisbane River Moreton Bay New Holland A.Cunningham 193/1828' plus a printed label 'ALLAN CUNNINGHAM'S AUSTRALIAN HERBARIUM Presented by Robert Heward Esq. 1862'.

The BM collection (cited by Foreman 1995) is annotated 'Moreton Bay' and lacks a collector, but is thought to be an Allan Cunningham collection.

No Bidwill material has been located.

The synonymy, formally, is:

Stenocarpus sinuatus Endl.

Genera Plantarum, Suppl. 4(2): 88 (1848). **Typus**: "Allan Cunningham, banks of the Brisbane River, Moreton Bay, 1828; T. Bidwill Esq., loc. cit., 1843 [fruits]; Weeks & Day, United Gardeners Society, Kings Rd, Chelsea, August 1847 [cultivated specimen]; Dr Balfour, Edinburgh Botanic Garden, 1848 [cultivated specimen]."

– **Lectotypus** (designated here): *Anon.* [? *Weeks & Day*] s.n., s. dat., Cultivated (London) "S. sinuatus Endl. V. 539, Flora Australiensis named by Mr Bentham, S. sinuatus Endl.! *Stenocarpus Cunninghamii* Hook. non Br. Bot. Mag. tab. 4263 1847 t.7, Herbarium Hookerianum", K!
– **Residual syntypi**: *A. Cunningham 193*, 1828, Brisbane River, Moreton Bay, New Holland "5. *Stenocarpus sinuatus* Endl. D.C.XIX 451 *Stenocarpus Cunninghamii* Hook. Bot. Mag. t. 4263 (non R.Br.) *Agnostus sinuatus* A.Cunn. ALLAN CUNNINGHAM'S AUSTRALIAN HERBARIUM Presented by Robert Heward Esq. 1862", K!; *Anon.* [? *Allan Cunningham*], s.dat., Moreton Bay, BM (fide Foreman, 1995, n.v.).

Agnostus sinuata Loudon, Hort. Brit. Suppl.1: 580 (1832), nom. nud., nom. inval.

Cybele sinuata (Loudon) Kuntze, Revis. Gen. Pl. 2: 578 (1891)

Stenocarpus cunninghamii Hook., Bot. Mag.: t. 4263 (1846), (as *cunninghami*), nom. illeg.

Stenocarpus sinuosus F.Muell., Fragm. 5: 154 (1866), nom. nud., nom. inval.

Stenocarpus sinuosus var. *integrifolius* F.Muell., Fragm. 5: 154 (1866) nom. nud., nom. inval., (as *integrifolia*)

It is worth noting that Chapman (1991) in listing many of these names, inadvertently attributed to Mueller (1866) two combinations that were never actually made, “*Stenocarpus sinuosus* F.Muell. var. *latifolium* F.Muell.” and “*S. sinuosus* var. *sectus* F.Muell.” Mueller actually described these taxa as varieties of *S. moorei* F.Muell., which is now considered synonymous with *S. salignus* R.Br. The Chapman combinations are at best invalid, not accepted by the author (he stated in the Introduction, p.xii, to the Australian Plant Name Index that he did not intend to make any formal nomenclatural actions). They are probably best treated as orthographic variants.

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What is the gender of *Sphenotoma* (Epacridaceae)?

A.E. Orchard

Australian National Herbarium, Centre for Plant Biodiversity Research,
G.P.O. Box 1600, Canberra ACT 2601³

The generic name *Sphenotoma* for a genus of 6–7 Western Australian Epacridaceae has been variously treated as feminine or neuter by different authors. The name was derived from two Greek words : *spheno* (m.) to connect or bind together, and *tomos* (m.) a slice or section. The gender of the compound word is fixed by the final part. So notionally the name is masculine. In Latin, *tomus* (book, volume, from the same root) is also masculine. So on the face of it, the generic name *Sphenotoma* should be masculine.

However the *International Code of Botanical Nomenclature* (Art. 62.1) states that gender of generic names is assigned by botanical tradition. That is, if the original author assigned the wrong gender and everyone followed him, then that overrides classical usage. What happened with *Sphenotoma*?

Sweet (1828) described only a single species *S. gracilis*. What does that say about the gender he was assigning? Unfortunately ‘*gracilis*’ is a Group B adjective (Stearn 1992)) and the ending can signify either masculine or feminine gender, but not neuter (which would be *S. gracile*).

³ Now P.O. Box 3427, Weston Creek ACT 2611

What did later authors do?

- Lindley (1832) made the combination *S. capitatum* (neuter)
- Don (1834) made the combination *S. squarrosa* (feminine)
- Sonder (1845) made the combination *S. dracophylloides* (masculine, feminine or neuter)
- Mueller (1883) made the combination *S. drummondii* (genitive, not relevant) and the combination *S. parviflorum* (neuter)
- Bentham (1869) put *Sphenotoma* in synonymy under *Dracophyllum* but gave the synonymous names neuter endings.
- Jacks (1970) and Newbey (1970) both treated it as neuter.
- Recent Western Australian checklists and censuses have treated *Sphenostoma* as neuter (see for example, Green, 1985; Paczkowska & Chapman, 2000); FloraBase website)
- APNI (Australian National Herbarium et al. 2004) treats the names as feminine (except 116631 *Sphenotoma gracile* (n.) which was taken from a WA source), following Arthur Chapman (1991).
- Watson & Dallwitz (2005) use the name *Sphenotoma gracile*, i.e., neuter.

Historical usage in Australia is thus ambiguous, although there is a tendency to treat the name as neuter, particularly in Western Australia where it grows. What about usage of *-toma* in other genera?

Within the Australian flora I can find only two other examples, *Crossotoma* (= *Scaevola*) and *Isotoma* in Goodeniaceae.

Unfortunately the only two taxa in *Crossotoma* are *C. oleoides* and *C. spinescens*, both of which have the same endings irrespective of gender, and are thus completely inconclusive.

Isotoma seems to have been fairly consistently treated as feminine, with about seven epithets ending in *-a* (the remainder are either genitive, or end in *-is*).

A search in *Index Nominum Genericorum* revealed only 23 generic names (excluding *Sphenotoma*) which were unequivocally compounds with a final part *-toma*. This seems to be a relatively rare construction in vascular plants but more common in algae. Of the 23 examples, 14 adopted a clear feminine gender, 4 adopted neuter gender, 1 was either masculine or feminine, and 4 were inconclusive (as for *Crossotoma*). Interestingly, *Polytoma* has been treated as feminine, as has *Parapolytoma*, but *Metapolytoma* is treated as neuter!

In summary, although the source words in the generic name are masculine, almost no-one treats the compound as masculine. The original author treated it as either masculine or feminine, the next author as feminine, and thereafter the usage became ambiguous, tending towards neuter. Parallel constructions in other families strongly favour treating it as feminine. This has the added benefit of the generic and specific epithets (Group A adjectives) both ending in *'a'* (e.g. *Sphenotoma squarrosa*) rather than, if neuter, having mixed *'a/um'* endings (e.g. *Sphenotoma squarrosus*) which many find confusing.

The weight of priority, usage, custom and aesthetics suggest that *Sphenotoma* should be treated as feminine.

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***Xylomelum benthamii* Orchard, a replacement name for *Xylomelum salicinum* (Meisn.) Benth., nom. illeg. (Proteaceae)**

A.E. Orchard

Australian National Herbarium, Centre for Plant Biodiversity Research,
G.P.O. Box 1600, Canberra ACT 2601⁴

The name of this Queensland taxon was based on *Xylomelum salicinum* A.Cunn. ex R.Br. (1830), a name mentioned only in synonymy, and thus invalid. It was validated as *X. pyriforme* β *salicinum* Meisn. (Meisner

1856). Bentham (1870) raised it to species status as “*X. salicinum* A.Cunn. in R.Br.” (and incidentally was the first to give Meisner’s name the formal rank of variety), but unfortunately cited *X. scottianum* in synonymy. The

⁴ Now P.O. Box 3427, Weston Creek ACT 2611

name *X. salicinum* is thus a superfluous illegitimate name, synonymous with *X. scottianum*. The plant currently called *X. salicinum*, based on *X. pyriforme* β (var.) *salicinum* Meisn. therefore requires a new name at species rank.

***Xylomelum benthamii* Orchard, nom. nov.**

Based on *Xylomelum pyriforme* var. *salicinum* Meisn. as (β *salicinum*) in A.L.P.P. de Candolle, *Prodr.* 14: 423 (1856), non *Xylomelum salicinum* (Meisn.) A.Cunn. ex Benth., *Fl. Austral.* 5: 408 (1870), nom. superfl. — *Xylomelum pyriforme* β R.Br. Suppl. *Prodr. Fl. Nov. Holl.* 31 (1830), nom. inval. — *Xylomelum pyriforme* var. *salicinum* Meisn. in A.P. de Candolle, & A.L.P.P. de Candolle, (eds), *Prodr.* 14(1): 423 (1856) — **Type:** on the Brisbane River about 88 miles [140 km] NW from the penal settlement on that stream [Qld], 25 June 1829, *A.Cunningham* 35; holo: K, iso: MEL. (fide D.B.Foreman, 1995).

The synonymy of *Xylomelum scottianum* is as follows:

***Xylomelum scottianum* (F.Muell.) F.Muell.**

Fragm. Phyt. Austral. 5: 174 (1866). — *Helicia scottiana* F.Muell., *Fragm.* 4: 107 (1864), **basionym.** — **Type:** Rockingham Bay, Qld, 8 Feb 1874, *J.Dallachy*; holo: MEL. (fide D.B.Foreman, 1995).

Xylomelum salicinum (Meisn.) Benth., *Fl. Austral.* 5: 408 (1870), nom. superfl.

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A new combination *Trema tomentosa* var. *aspera* (Brongn.) Hewson (Ulmaceae)

H.J. Hewson

Australian National Herbarium, Centre for Plant Biodiversity Research,
G.P.O. Box 1600, Canberra ACT 2601

E. Soepadmo (1977) treated *Trema viridis* as a synonym of *Trema cannabina*, while recognising the other two Australian taxa, *T. orientalis* and *T. tomentosa* as distinct species. In *Flora of Australia* (1989) I adopted the view that the name *T. cannabina* was misapplied to Australian collections, and that they should be recognised as constituting a distinct taxon.

I believed that this taxon was closely related to *T. tomentosa*, and proposed that it be treated as a subspecies of that species. A new combination was required, and I published *Trema tomentosa* var. *viridis* (Planch.) Hewson (1989).

Unfortunately, at the time I had overlooked Article 57.3 of the 1983 ICBN (now Art. 11.6) which rules that the autonym has priority over the name of the same date and rank that created it. Accordingly, my combination is invalid. The correct combination is *Trema tomentosa* var. *aspera*, which is formally created below.

The synonymy relates to Australian occurrences of the taxon only.

***Trema tomentosa* var. *aspera* (Brongn.) Hewson, comb. nov.**

Celtis aspera Brongn., in L.I.Duperrey, *Voy. Monde* (Phan.) 213, t. 48 (Atlas) (1834) **basionym.** — *Sponia aspera* (Brongn.) Decne, *Nouv. Ann. Mus. Hist. Nat.* 3: 498

(1834) — *Trema aspera* (Brongn.) Blume, *Mus. Bot.* 2: 58 (1856) — *Trema aspera* (Brongn.) Blume var. *aspera*: G. Benth., *Flora Austral.* 6: 158 (1873) — *Trema aspera* var. *typica* Domin, *Biblioth. Bot.* 89: 560 (1921), nom. inval.

Sponia viridis Planch., *Ann. Sci. Nat. Bot. ser.* 3, 10: 319 (1848) — *Trema viridis* (Planch.) Blume, *Mus. Bot.* 2: 58 (1856) — *Trema aspera* var. *viridis* (Planch.) Benth., *Fl. Austral.* 6: 158 (1873) — *Trema tomentosa* var. *viridis* (Planch.) Hewson, *Fl. Austral.* 3: 190 (1989), nom. inval.

Trema aspera var. *xerophila* Domin, *Biblioth. Bot.* 89: 6 (1921)

Acknowledgements

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***Stackhousia subterranea*, a new name and revised circumscription for *S. gunnii* Hook.f. (Stackhousiaceae–Celastraceae)**

W.R. Barker^{a,b}

^aState Herbarium of South Australia,
Hackney Road, Adelaide, South Australia 5000

^bAustralian Centre for Evolutionary Biology and Biodiversity,
The University of Adelaide, South Australia 5005
Email: barker.bill@saugov.sa.gov.au

It became evident on examination of Tasmanian populations of *Stackhousia gunnii* Hook.f. in the field in 1995 that this species is conspecific with an unnamed mainland race of *S. monogyna* Labill. s.lat. This race is widespread in mallee habitats on calcareous loams on the southeastern Australian mainland (Barker 1986, 1999).

In my account in the *Flora of Australia* (Barker 1984), *S. monogyna* was circumscribed very broadly to encompass all racemose species with single flowers at each node in the inflorescence and cocci without wings. The *Flora* treatment was, through urgency, an interim pre-revisional view of the family in which many good, previously recognised taxa across southern Australia were swept under this name. Earlier and subsequent treatments for South Australia (Barker 1969, 1977, 1986, 2005) and a subsequent treatment for Victoria (Barker 1999) resurrected some of these taxa. A paper in its advanced stages will go a long way to resolving this complex (Barker, in preparation); it gives the basis for the concepts provided to and presented in the Australian Plant Census (W.R. Barker in Council of Heads of Australasian Herbaria 2006).

Since its detailed description in 1855 (Hooker 1855), *S. gunnii* Hook.f. has been considered a Tasmanian endemic, restricted to the dry midlands region of the island. It has been listed as an endangered species in Tasmania (Kirkpatrick et al. 1991; Department of Primary Industries & Water 2006), a status that is under review following understanding of its wider distribution (M. Duretto pers. comm., early 2006).

A new name is here supplied for the species currently known as *S. gunnii* because that name is illegitimate, being a later homonym (Barker 1969). It is predated by the earlier name *S. gunnii* Schldl. (Schlechtendal 1847), which is based on a different Tasmanian specimen collected by Ronald Gunn (no. 69), and is a synonym of *S. monogyna* Labill., in its strict sense (Barker 1969).

***Stackhousia subterranea* W.R.Barker, nom. nov.**

Replaced name: *Stackhousia gunnii* Hook.f., Fl. Tasman. 1:79 (1855), nom. illeg., [non *S. gunnii* Schldl., Linnaea 20: 642 (1847)]. **Lectotypus hic designatus:** *Gunn 1048/1842*, 6 Nov 1843, Formosa./ Open sandy pasture land. K s.n. (p.p.) (specimen closest to label); *isolectotypi*:

K s.n. (p.p.: other specimens on lectotype sheet attributable to Formosa collection on sheet); *isolectotypus probabilis*: *Gunn 1048*, 6 Nov 1843, Formosa, NSW148156 (p.p.); *syntypi*: *Gunn 1048*, 30 Oct 1845, Snake Banks K s.n. (p.p.); *syntypi probabiles*: *R. Gunn 1048/1842*, 29 Oct 1841. At Formosa, Lake River, BM s.n. (p.p.); *R.C. Gunn s.n.*, s.dat., "Ex Herb. Hook./Stackhousia Gunnii, Hook. fil./ Hab. Tasmania". M s.n. S s.n. WU s.n.; *syntypus possibilis*: *Gunn 1048*, 6 Nov 1843, Formosa. Open pastures. NSW148156 (p.p.).

S. flava auct. non Hook.: J.M.Black, Fl. S. Austral 2: 538 (1952), p.p.

S. sp. 1: W.R.Barker, Fl. Victoria 4: 51 (1999)

S. aff. monogyna (Western Plains): J.H.Ross, Census Vasc. Pl. Victoria edn 5 (1996)

S. monogyna auct. non Labill.: W.R.Barker, Fl. Austral. 22: 188 (1984), p.p.; W.R.Barker, Fl. S. Austral. 806 (1986), p.p.; W.R.Barker, Cens. S. Austral. Vasc. Pl. 89 (2005), p.p.

Typification

The sheet bearing the lectotype also bears a collection *Gunn 1048* from Snake Banks. The lectotype should come from this sheet as Hooker's (1855) protologue matches one of Gunn's handwritten labels and, as alluded to in the protologue, the suite of plants are quite uniform. There is doubt in matching the two collection labels on the sheet with the many flowering branches on the sheet. In the National Herbarium of New South Wales (NSW) there is a duplicate of the chosen lectotype label, but this is of little help as, in keeping with what Gunn has written, the plants are very uniform, as they are throughout all isosyntypes. The solution has been to take the nearest specimen to the label as the lectotype, taking advice (P.S. Green, pers. comm., early 1970s), that material in the Hooker Herbarium at the Royal Botanic Gardens, Kew (K) is mounted close to the pertinent label, and to designate other material as belonging to either isolectotype or other syntype material.

Etymology

The Latin adjective *subterraneus* alludes to the distinctive method of perennation from an underground root system, which in the genus is restricted to this species.

Diagnostic features, distribution and ecology

Stackhousia subterranea is closely allied to *S. monogyna* Labill., in its strict sense applied here. Amongst species with flowers single in the axils, these two species share the feature of reduced (vestigial) bracteoles. *S. subterranea* differs from *S. monogyna* s.str. by its horizontal roots deep in the soil, from which clonal aerial stems or clusters of stems arise (Barker 1986, 1999), its thick rather fleshy leaves, its bracts outwardly saccate in the basal half or two-thirds (Barker 1977, fig. 1A), and its tetraploid chromosome number (Barker 1969; M. Kiehn & W.R. Barker, in preparation). It is widespread in calcareous mallee woodlands and associated more open vegetation of peninsular regions of South Australia to south-eastern Australia and Tasmania.

By comparison (Barker 1986, 1999), *S. monogyna* s.str. is also perennial, but initially with a single aerial stem and in subsequent years clusters of stems arising from a vertical tap root. The species commonly has thin pliant leaves, bracts hardly swollen at the base, and (M. Kiehn & W.R. Barker, in preparation) a diploid chromosome number; and is widespread in wet and dry sclerophyll forests and coastal habitats of eastern Australia, with a possible outlier in the southern Flinders Ranges of South Australia.

Ronald Campbell Gunn, noted for his intimate observations so important to the documentation of Tasmanian plants by colleagues such as J.D. Hooker, observed the difference in root system between the two species (Hooker 1855). The notes in Gunn's hand on the lectotype about *S. subterranea* incorrectly indicate, however, that *S. monogyna* (Gunn 69: as *S. obtusa*) is annual:

1048. *Stackhousia*. Certainly a distinct species. It is not uncommon in all the open sandy pasture lands of Norfolk Plains, Epping Forest, &c – usually having one single stalk only, and the root seems in many cases to run along under the surface of the ground. At all counts the root is not fibrous like my 69. - I believe it to be perennial whereas 69 is annual. The colour of the flowers is yellowish cream colour; & it flowers about 1 [Nov^r].

Hooker (1855) disagreed with Gunn, specifying that the roots of *S. monogyna* were perennial.

Conservation status

While the species overall is not at all endangered, being common in many parts of its range in mainland Australia, the endangered status accorded the Tasmanian populations in its diminished midlands habitats

(Department of Primary Industries & Water 2006) should surely be retained.

Acknowledgements

Louise Gilfedder is thanked for taking me on a day in the field in October 1995 in Tasmania's midlands to view scattered populations of "*S. gunnii* Hook.f."

Marco Duretto's encouragement to publish this name change to meet the desire by Tasmanians to clear up the conservation status of their species is greatly appreciated.

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***Eucalyptus viminalis* subsp. *hentyensis* Brooker & Slee new from Tasmania**

M.I.H. Brooker & A.V. Slee

Australian National Herbarium, Centre for Plant Biodiversity Research,
G.P.O. Box 1600, Canberra ACT 2601

The following subspecies of *Eucalyptus viminalis* was described in the CD interactive key EUCLID (Brooker et al., 2002). This publication, being electronic, was ineffective under the ICBN, and the formal publication is effected here. For additional description and discussion, see EUCLID.

Eucalyptus viminalis* subsp. *hentyensis* Brooker & Slee, *subspecies nova

Eucalyptus viminalis subsp. *hentyensis*: a subspeciebus aliis, foliis juvenilibus grossis late lanceolatis vel ellipticis, inflorescentiis 3 et 7 floribus in eadem arbore, cortice aspero minimo vel cortice laevi differt. Arenam infertilem albidam habitans.

Type: Tasmania: S of Henty River, between Zeehan and Strahan, 42°2'16"S, 145°16'13"E, 19 Jan. 1996, *M.I.H. Brooker 12467 & A.V. Slee*; holo: CANB; iso: HO, MEL, NSW.

Distribution & notes. Endemic to Tasmania where it grows on poor white sands on the west coast, north from

Strahan. Subsp. *hentyensis* has little rough bark, coarse, broad juvenile leaves and buds in 3s or 7s.

Etymology: from the Henty River, western Tasmania.

Other specimens examined: Tasmania: S of Henty River, between Zeehan and Strahan, 19 Jan. 1996, *M.I.H. Brooker 12468, 12469, 12470 & A.V. Slee* (CANB); Henty sand dunes picnic area, 20 km N of Strahan, 5 Sep. 1979, *A.M. Gray 417, 418, 419* (CANB, HO); West Coast: Henty Road at the Henty River Bridge c. 18 km south of Zeehan, 24 May 1985, *A.M. Gray 660* (CANB); Henty road, c. 1 km south of the Henty river bridge, 24 May 1985, *A.M. Gray 662* (CANB, HO).

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A new status in *Nicotiana* (Solanaceae): *N. monoschizocarpa* (P.Horton) Symon & Lepschi

D.E. Symon^a & B.J. Lepschi^b

^aState Herbarium of South Australia,
Hackney Road, Adelaide, South Australia 5000

Email: symon.david@saugov.sa.gov.au

^bAustralian National Herbarium, Centre for Plant Biodiversity Research,
G.P.O. Box 1600, Canberra ACT 2601

Nicotiana monoschizocarpa* (P.Horton) Symon & Lepschi, *comb. & stat. nov.

Basionym: *Nicotiana debneyi* subsp. *monoschizocarpa* P.Horton, *J. Adelaide Bot. Gard.* 3: 12 (1981). **Type:** Daly River Crossing, Daly River Road, N.T., 28 Sept. 1973, *J. McKean 1183* (holo: NT; iso: CANB, DNA, NSW).

N. monoschizocarpa differs from *N. debneyi* in having staminal filaments less than 4mm long (cf. 6–11

mm in *N. debneyi*) inserted high in the corolla tube (cf. low in tube); corolla lobes narrow, acute to narrowly obtuse (cf. broad & obtuse), capsule 2-valved (cf. 4-valved). The natural populations are widely disjunct (Haegi et al. 1982: maps 39–40).

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***Euphrasia tasmanica* Gand. formally reduced to
a subspecies in *E. collina* R.Br.⁵**

W.R. Barker^{a,b}

^aState Herbarium of South Australia,

Hackney Road, Adelaide, South Australia 5000

^bAustralian Centre for Evolutionary Biology and Biodiversity,

The University of Adelaide, South Australia 5005

Email: barker.bill@saugov.sa.gov.au

In my revision of Australian *Euphrasia* (Barker 1982) *Euphrasia tasmanica* Gandoger was reduced to synonymy under *E. collina* R.Br. Although many subspecies were formally recognised within the species, a putative race including the type of this name was given the informal designation *E. collina* ssp. '*tasmanica*'.

While the separation of glandular-hairy lowland Tasmanian populations into four subspecies is not entirely satisfactory and warrants closer study, a formal name for the subspecies is desirable as it usefully caters for variants not coming under other taxa. The combination is formalised here.

***Euphrasia collina* R.Br. subsp. *tasmanica* (Gand.)**

W.R. Barker, comb. & stat. nov.

Euphrasia tasmanica Gand., Bull. Soc. Bot. France 66 (1912) 218, **basionym**; Briggs in McGillivray, Contr. N.S. Wales Nat. Herb. 4 (19734) 339; W.R. Barker, J. Adel. Bot. Gard. 5 (1982) 160, 198, as syn. — **Holotype**: Simson 58, 17.x.1875. Georges Bay, LY (Herb. Spicer).

Euphrasia collina R.Br. ssp. '*tasmanica*': W.R. Barker, J. Adel. Bot. Gard. 5 (1982) 198.

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⁵ Taxonomic studies in *Euphrasia* L. (Scrophulariaceae). IX.

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Review of *Acacia retinodes* and closely related species, *A. uncifolia* and *A. provincialis* (Leguminosae: Mimosoideae: sect. Phyllodineae)

M.C. O'Leary

State Herbarium of South Australia,
Hackney Road, Adelaide, South Australia 5000
Email: Oleary.Martin@saugov.sa.gov.au .

Abstract

Since the description of *Acacia retinodes* Schltldl. in 1847, there has been confusion about its identity. Extensive fieldwork has been conducted on this species and related taxa, material and literature examined, and the taxa delimited. Three species are recognised here which previous authors have confounded with varying interpretations under *A. retinodes* Schltldl., and they are described, illustrated and discussed in full. *Acacia retinodes* Schltldl. is now considered to be endemic to the Mt Lofty Ranges of South Australia. *Acacia provincialis* A.Camus, which is here lectotypified, has a discontinuous distribution in south-eastern Australia from the Mt Lofty Ranges and Kangaroo Island, South Australia, the Grampians and Glenelg River to near Melbourne, Victoria; it has become naturalised in Southern Europe and North America. *Acacia uncifolia* O'Leary is raised for the first time to species level; treated previously as a variety of *A. retinodes* Schltldl., it has a disjunct distribution in coastal areas from Kangaroo Island and southern Fleurieu Peninsula in South Australia, King and Flinders Islands in Bass Strait and from Torquay to Wilsons Promontory in Victoria.

Introduction

This paper presents morphological and habitat characters that warrant the recognition of *A. retinodes*, *A. uncifolia* and *A. provincialis* as distinct and separate species, these three species having hitherto been confounded under *A. retinodes*.

Taxonomic history

Acacia retinodes was published by Schlechtendal in *Linnaea* in 1847, based on material collected in January 1845 by Dr Herman Behr, likely to be from the Barossa Valley, South Australia. The holotype and isotype are flowering branches with linear phyllodes, representing the phyllode shape found on mature trees. Pods were not described in the protologue. From the field notes provided by Behr, Schlechtendal recorded that the species occurred in “rich soils near water in the valleys”.

During his four-year stay from late 1847 in South Australia (Willis 1949) Mueller made several collections that he identified as *A. retinodes* (see later), but many of these were from slightly wetter habitats with different species associations than those found at the type locality. The “rich soils near water in the valleys” that occur south of the Barossa Valley near Adelaide are a habitat for what, in this paper, is recognised as *A. provincialis*, a species closely related to *A. retinodes* but which does not occur in the Barossa Valley. While *A. retinodes* can occur in rich soils near water, it also extends to relatively

dry plains and hillsides, a habitat that does not support *A. provincialis*.

The first collections of *A. uncifolia* appear to have been made by Robert Brown from Port Phillip in 1802, although it is likely that this coastal species was also encountered on Kangaroo Island. Bentham included this collection in his account of *A. retinodes* in 1864, but it was only in 1932 that Black recognised this taxon as a variety of *A. retinodes*.

Judging from information on herbarium labels, Mueller appears to have distinguished between the two taxa (*A. provincialis* and *A. retinodes*) he collected from near Adelaide. His National Herbarium of Victoria specimen *Mueller MEL2082743* has labels from three localities, Onkaparinga River, Morialta Gully and Brown Hill Creek, accompanied by specimens of *A. provincialis*. Details from these labels indicate that Mueller was questioning the identity of the plants he had collected as *A. retinodes*. On his Brown Hill Creek and Onkaparinga River labels Mueller provided the distinguishing characters of *A. provincialis*; namely, restricted damp riverbank habitats, slender growth form, golden-yellow flowers with a long flowering period and a character which is very obvious in the field, “*Truncus laevis! Nei rugosus ut A. retinodes!*” (its smooth trunk, not rough like *A. retinodes*!).

Bentham saw the Onkaparinga River and Brown Hill Creek specimens (which represent *A. provincialis*) on *Mueller MEL2082743*, together with a specimen of *A. retinodes* from the Torrens River, (mixed with

A. provincialis) on Mueller MEL2082778. However, Mueller's apparent distinction between the two species appears not to have been recognised by Bentham. It also appears that Mueller and Bentham were confounded by the phyllode variation on some of the other specimens of these and other related taxa that they saw. Habitat, habit, flowering period and bark are characters that most obviously separate these two species in the field. However, these and other closely related species can be confused on herbarium specimens because of similar phyllodes, inflorescences and pods.

In 1855 Mueller (now residing in Melbourne) included Victoria in the distribution for *A. retinodes* (Bentham 1855), and in 1858 he provided a description of pods and seeds. However, it is now known that the pod and seed description refers to *A. provincialis*, while the information for the distribution in Victoria relates to both *A. provincialis* and *A. uncifolia*, not *A. retinodes*. His data was published in Mueller (1859).

The *Flora Australiensis* account of *A. retinodes* by Bentham (1864) contains elements of *A. retinodes* and *A. provincialis*, as well as *A. uncifolia* and other species, namely, *A. alcockii* ("Memory Cove, R. Brown"), and probably *A. rivalis* ("Flinders Range, Mueller"). The collections from Kangaroo Island by Waterhouse relate to *A. provincialis* and *A. uncifolia*, the collection from Port Phillip (R. Brown) relates to *A. uncifolia*, while the Victorian collections from "grassy ridges and open valleys throughout the greater part of the colony" (Mueller) relate to *A. provincialis*. Behr's original observation of "very frequent in rich soils near water in the valleys" was also included, and represents both *A. retinodes* and *A. provincialis*.

Confusion over the identity of *A. retinodes* continued for many years. Mueller's (1887) illustration of *A. retinodes* is of *A. provincialis*. Collections from South Australia, where all three taxa exist, tended to be placed under the name *A. retinodes*, but often have questioning field comments. In 1882, Tepper (AD96920224) mounted several specimens on a single sheet, where *A. provincialis* is named as *A. retinodes*, and *A. retinodes* is annotated as *Acacia* var? sp?. Another Tepper collection (MEL2082736) (of *A. retinodes*) notes; "This *Acacia* is quite different in habit from *A. retinodes*, as in some localities it ascends dry rocky hills, while the other is restricted to moist localities and creeks etc." Collections of *A. retinodes* by Black note "Narrow-leaved form of *A. retinodes*" (Black AD9672804), and "grows on the dry hillsides & drifts downwards: bark very dark & rough on trunk, taller than *retinodes*, 20-25 feet sometimes, flowers xmas till beginning Feb.!" (Black AD96728025). Numerous other collections record the distinct habitats of the three taxa, "near water", "away from water", "dry hillsides" and "coastal dunes".

In 1932 Black published *A. retinodes* (as *rhetinodes*) var. *uncifolia*, from near Waitpinga Beach, with a concise habitat description of "growing in sand and limestone, away from water". The accompanying observation that "The small phyllodes, terminating in a curved, almost hooked

micro, give this variety a very different appearance from the type, which is usually found in gullies or near creeks", seems in part a legacy from the misapplication of the name, as it appears that Black considered the *A. provincialis* taxon to represent *A. retinodes*. Earlier collections of the coastal taxon with narrow phyllodes, were often either identified as *A. retinodes*, "*Acacia* sp.", or had accompanying field notes of "small form of *A. gillii*" (Cleland AD96546076), "away from water" (Cleland AD96728029), "near *A. retinodes*" (White AD96728027).

In describing *A. provincialis* Camus (1927) thought it represented a hybrid between *A. retinodes* and *A. saligna*. However, he was describing for the first time the taxon from near Adelaide that Mueller had noted some 80 years earlier as having a long flowering period and smooth trunk. What Camus presumed to be the *A. retinodes* parent was also *A. provincialis*. This species had been in cultivation in the south of France since the 1870s, and was popular in the cut flower trade as noted by Vilmorin (1894), Anon. (1919), and Stapf & Ballard (1929).

Acacia retinodes and *A. provincialis* have remained confounded to recent times. For example, Whibley (1980) includes a photograph and illustrations representing these two species and *A. uncifolia*. He did consider however that these three taxa required further study (Whibley pers. comm.). Later Whibley & Symon (1992) and Maslin (2001a, b) identified the three taxa but did not afford them species status. Recent publications have referred to *A. provincialis* informally as *A. retinodes* Schltdl. var. *retinodes* "Swamp Wattle" in Maslin (2001b), *A. retinodes* Schltdl. var. *retinodes* "swamp variant" in Maslin (2001a) and Maslin & McDonald (2004), "*Acacia* sp. *Swamp* (N.M.Smith 3022) O'Leary" in Barker et al (2005), and "*Acacia* sp. *Swamp* (N.M.Smith 3022) SA Herbarium" in CHAH (2006).

Maslin (1995, 2001b) treated *A. retinodes* as a member of the '*A. microbotrya* group', noting that it is perhaps most closely allied to *A. confluens*, *A. leiophylla*, *A. rivalis* and *A. gillii*. *Acacia retinodes*, *A. uncifolia* and *A. provincialis* can also be confused with forms of *A. penninervis*, *A. rubida*, *A. quornensis*, *A. euthycarpa*, *A. neriifolia* and *A. alcockii*. *Acacia saligna* can also bear a superficial resemblance to *A. retinodes*, but can be distinguished by its plate glands, floral bracts and larger flowers. Distinctions between these species can be found in (Maslin 2001a, b) and on the website World Wide Wattle (2006).

Taxonomy

The distinctions between *A. retinodes*, *A. uncifolia* and *A. provincialis* are summarised in Table 1.

1. *Acacia retinodes* Schltdl.

Linnaea 20:664 (1847). — *Racosperma retinodes* (Schltdl) Pedley, *Austrobaileya* 6(3): 484 (2003). **Type citation:** "Sehr verbreitet auf fruchtbarem Boden in der Nähe des Wassers in den Thälern, Januar." [Barossa Valley, S.A., perhaps from Schlinckens Ck]. **Holotype:** H. H. Behr s.n., without locality or date; HAL, n.v.; (photo: PERTH), **isotype:** MEL616152.

Table 1. Principal morphological and habitat features distinguishing *A. retinodes*, *A. uncifolia*, and *A. provincialis*.

Species	<i>Acacia retinodes</i>	<i>Acacia uncifolia</i>	<i>Acacia provincialis</i>
Habitat	Hills and plains	Coastal sands over limestone	Wet soil, creeks and swamps
Habit, ability to sucker	Erect tree, suckering	Rounded multi-branched shrub to tree, suckering	Slender to dense erect tree, not suckering
Bark	Rough, black to dark brown	Smooth-fissured, grey to dark brown	Smooth, grey
Phyllode length	(50-)60–160 mm long	(25-)30–75(-80) mm long	Variable, 90–200 mm long
Phyllode spacing along stem	Crowded, 4–10 mm apart	Crowded, 4–10 mm apart	Uncrowded, 10–20 mm apart
Phyllode apex	Uncinate	Uncinate or greatly so (recurved)	Straight or uncinate
Pruinosity	Non pruinose	Non-pruinose	Often lightly pruinose
Flowering time: normal (sporadic)	December–February	September–January (throughout the year)	September–January (throughout the year)
Flower colour	Cream to pale yellow	Cream to pale yellow	Golden, rarely pale, yellow
Flower no.	(16-)18–30(-34)	(16-)18–30(-32)	(18-)30–50(-54)
Ovary	Glabrous	Hairy	Glabrous
Pod width	8–11 mm	5–7 mm	5–7 mm

A. retinodes auct. non Schldtl.: Mueller, J. Linn. Soc. 3: 126 (1859), partly, excluding pod description which is *A. provincialis*; Bentham, Fl. Austral. 2: 362–363 (1864), partly; Bentham, Trans. Linn. Soc. 30: 468 (1875), partly, excluding pod description which is *A. provincialis*; Mueller, Syst. Census Austral. Pl. 1: 44 (1882), partly; Black, Fl. S. Austral. 2: 277 (1924), partly; Adamson & Osborn, Trans. Proc. Roy. Soc. S. Austral. 48: 118, 137. (1924), partly; Stapf & Ballard 153: t. 9177, Bot. Mag. (1929), partly; Black, Fl. S. Austral. edn 2: 411 (1948), partly; Whibley, Acacias S. Australia. 112 (1980), partly; Boomsma, Native Trees S. Australia. 75 (1981), partly; Costermans, Native Trees & Shrubs SE Australia 319 (1981), partly; Elliot & Jones, Encycl. Austral. Pl. 2: 106 (1982), partly; Whibley, Fl. S. Austral. 2: 555 (1986), partly; Prescott, Its Blue With Five Petals. 90 (1988), partly; Simmons, Acacias Australia. 2: 176 (1988), partly; Dashorst & Jessop, Pl. Adelaide Plains Hills. 78 (1990), partly; Tame, Acacias SE Australia. (1992), partly; Whibley & Symon, Acacias S. Australia 142 (1992), partly; Maslin et al., Edible wattle seeds Sn Austral. 42 (1998), partly; Maslin, Fl. Austral. 11A: 281 (2001), partly.

A. retinodes Schldtl. ('Normanville' variant): Maslin & McDonald, AcaciaSearch Eval. Acacia 182 (2004).

Illustrations and photographs.

Whibley (1980), 113 (photograph); Whibley & Symon (1992), 143 & 145 (photographs); Maslin et al. (1998), 43 (photographs); Maslin (2001a), "(*A. retinodes* var. *retinodes* 'typical variant')"; Maslin & McDonald (2004), 171, "(('typical' variant))" & 183, "(('Normanville' variant))" (photographs).

Upright tree to 10 m tall, with an erect branching habit, outer branches occasionally pendulous on mature plants, limited suckering present. *Branchlets* reddish, flattened, 3-angular and ribbed at first but soon terete, glabrous. *Bark* rough, furrowed, dark brown to black. *New shoots* glabrous, not pruinose. *Stipules* narrowly

to shallowly triangular, smooth to finely ribbed, often resinous, drying reddish brown, 0.5–1 mm long, minutely ciliate. *Phyllodes* variable (corresponding to growth phase of plants and seasonal conditions), oblanceolate to narrowly oblanceolate to linear, gradually narrowed towards the base, (50-) 60–160 mm long, (2-) 3–12 (–16) mm wide, ascending to spreading, straight or more usually shallowly recurved, glabrous, green to grey-green, often with a silver-satin sheen in sunlight in drier months, crowded on stems, 4–10 mm apart; *midrib* central; *lateral nerves* obscure, *marginal nerves* narrow and yellow to light brown; *apices* acuminate, normally uncinate, with innocuous mucro; *gland* single on upper margin of phyllode 0–3 (–7) mm above pulvinus. *Inflorescences* racemose, fragrant, 20–40 (–50) mm long, with 5–10 (–12) heads; *peduncles* 3–6 mm long, slender, glabrous; *heads* globular, 8 mm diam. (when fresh, drying 4–5 mm diam.), (16–) 18–30 (–34) flowered, cream to pale yellow. *Flowers* 5-merous; *sepals* clearly united, $\frac{1}{3}$ – $\frac{1}{2}$ petal length, oblong-oblanceolate to spatulate, with silver-cream hairs; *petals* 1.2 mm long, coated with short white hairs and papillose hairs lining edge and at summit, 1-nerved. *Ovary* glabrous. *Pods* linear, to 160 mm long, 8–11 mm wide, *Seeds* longitudinal in pods, oblong to oblong-elliptic, 4–6 mm long, dull to slightly shiny, dark brown to black; funicle $\frac{3}{4}$ or more encircling seed in double fold, reddish brown to blackish; *aril* clavate. Fig. 1.

Distribution (Fig. 2).

Endemic to the Mount Lofty Ranges in South Australia, from near Mt Bryan and Clare, south to Normanville and Delamere on the southern Fleurieu Peninsula. Plantings in the southeast region of South Australia have become naturalised to a limited extent

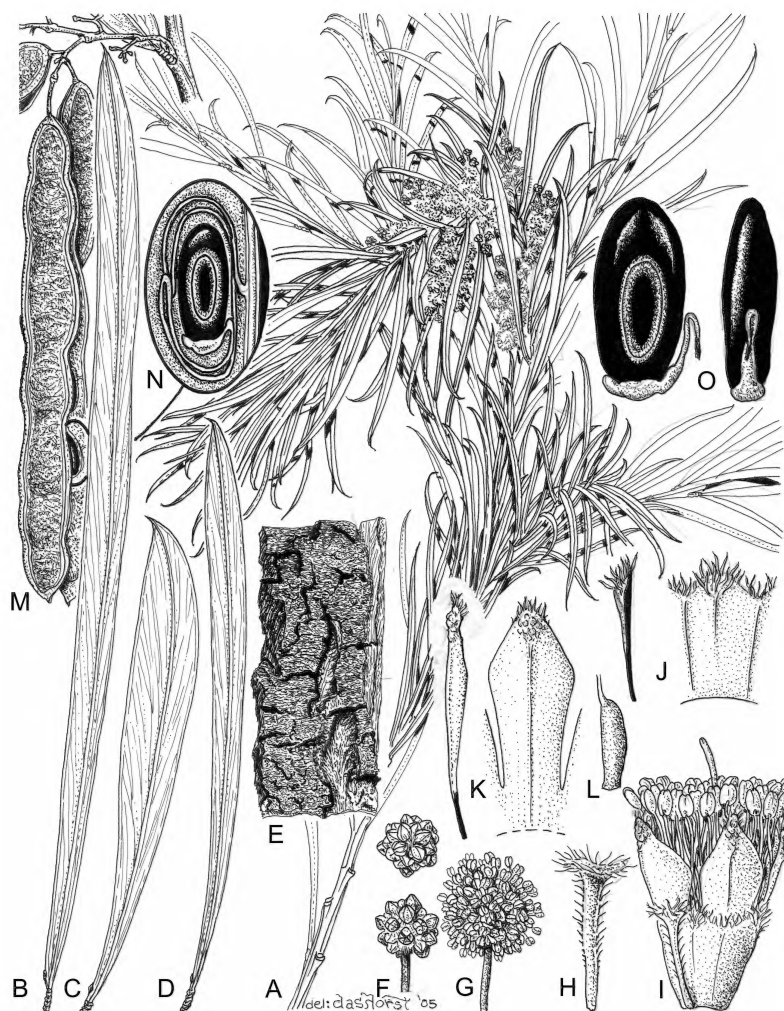


Fig. 1. *Acacia retinodes*. A – Flowering branch with mature phyllodes. B – D Phyllodes showing range of variation. E – Bark. F – Unopened inflorescence. G – Opened inflorescence. H – Bract. I – Flower showing fused sepals, free petals and stamens. J – Fused sepals with fringing hairs. K – Petals showing central rib and terminal hairs. L – Glabrous ovary. M – Pods. N – Seed showing terminal aril and funicle encircling in double fold. O – Seed in plain view showing pleurogram (left) and side view (right). (A composite from Kraehenbuehl 725; B from O'Leary 2518 (left hand phyllode); C from Bates 35891 (central phyllode); D from Donner 1287 (right hand phyllode); E from O'Leary 2729; F – L from Kraehenbuehl 275; M – O from Bates 35891. A&D x1; B x1/2; C x18; E x8; F x7; G&H x27; I,J&K x56; L x2; M x6; N-Q x9.

(e.g. the Millicent to Mt Gambier road). The species distribution is mapped by Maslin (2001a), as var. *retinodes* (typical variant) and Maslin & McDonald (2004, map 53).

Habitat.

Occurs in developed soils on low hills and ranges, in South Australian blue gum, peppermint box, and red gum woodlands, with an annual rainfall of 350–1000

mm. Associated species include *Eucalyptus leucoxylon*, *E. odorata*, *E. microcarpa*, *E. camaldulensis*, *E. obliqua*, *Bursaria spinosa*, *Allocasuarina verticillata*, *Acacia pycnantha*, *A. melanoxylon*, *A. paradoxa* and *A. euthycarpa*.

Conservation status.

Only remnants of the original habitat of *A. retinodes* remain, as much has been cleared for farming. *A.*

retinodes is palatable to stock and as early as the mid 1840s Behr noted the destructive effects grazing had caused to the habitat of the species. Many of the remaining populations appear to be confined to road verges, this in part due to its limited ability to sucker. Populations occur in Spring Gully Conservation Park, Kaiserstuhl Conservation Park, Anstey Hill Recreation Park, Black Hill Conservation Park, Morialta Conservation Park, Cleland Conservation Park, Mount Crawford Forest Reserve and Mt Bold Reservoir Reserve. However, most of these populations are small remnants, with the long-term viability of these being of some concern. Using the criteria of Briggs & Leigh (1996), a code of 3RCa is recommended for *A. retinodes*.

Flowering and fruiting period.

Flowering occurs in a distinct season from late December to February. Legumes with mature seeds have been collected from December to early February, these developing over winter from the previous seasons flowers.

Typification

The species was described by Schlechtendal (1847). Although the holotype is without locality or date, it was collected by Behr and annotated by Schlechtendal as "*Acacia retinodes* Schldl. Linn. xx. p. 664" (B.R. Maslin, pers. comm.). An interpretation of the type citation by Kraehenbuehl (pers. comm.) is that Behr collected this species in the Barossa Valley, South Australia, perhaps from Schlinckens Creek (where it still occurs). Behr's collecting localities are discussed in Kraehenbuehl (1981).

Variation

A variant of *A. retinodes* occurs at Yankalilla Bay over a 5 km area between Carrickalinga, Normanville and Lady Bay. It grows on sandy loams that run from behind coastal dunes to low hills about 2 km inland, and is restricted to a few remnant patches of vegetation and scattered individual plants. This variant is now considered to be a coastal form of *A. retinodes*, although previously it was thought to be a possible stable hybrid with *A. uncifolia*; see Maslin & McDonald (2004, as *A. retinodes*, 'Normanville' variant) for discussion.

Morphological characters of the Yankalilla Bay plants differ little from *A. retinodes* plants that occur elsewhere, apart from a more branched growth habit and having a few flowers in spring (i.e. September to November). Flowering is still largely restricted to a single season from December to February; the sporadic spring flowering of the Yankalilla plants may be due to the influence of the maritime environment in which it occurs. Young plants in sheltered sites have a single erect stem similar to typical *A. retinodes* from inland areas, so the bushy form may well be a response to physical pruning from coastal winds. Bark is predominantly rough in the population, although the photo in Maslin & McDonald (2004) is of a smooth bark specimen. The Yankalilla population lies

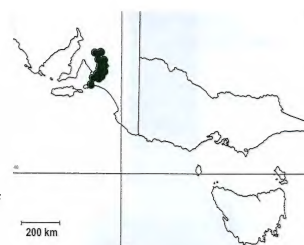


Fig. 2. Distribution map of *Acacia retinodes*.

within the original distribution of *A. retinodes*, and these were probably one of the only places where the species reached the coast. The closest population of *A. uncifolia* occurs 25 km away on sands overlying limestone, and where there are close associations with the vegetation of Kangaroo Island (where *A. retinodes* is absent). The Yankalilla Bay area has been largely cleared for farming and more recently housing subdivisions. Sections were also subjected to sand mining in the past with subsequent limited revegetation with exotic and local Australian species. No formal taxonomic rank is required for the Yankalilla Bay populations, although local revegetation and conservation measures are recommended to preserve this rare localised variant. These plants are readily distinguished from *A. uncifolia* by their longer phyllodes and glabrous ovaries.

Affinities

As noted by Maslin (2001a, b) *A. retinodes* is a member of the informal, Australia-wide '*Acacia microbotrya* group', of species. Its closest affinities are with *A. provincialis* and *A. uncifolia* (see Table 1) but it is also closely related to *A. confluens*, *A. leiophylla*, and *A. rivalis*.

Hybrids

No hybrids involving *A. retinodes* have been seen by the author. Maslin (2001a, b) noted that *A. semiaurea* is possibly a hybrid between *A. retinodes* and *A. argyrophylla* or *A. brachybotrya* (appressed haired variant). Although the author has not seen type material of *A. semiaurea*, the description for this species matches specimens of *A. argyrophylla* from Yorke Peninsula that are possible intergrades between that species and *A. brachybotrya* (appressed-haired variant). It is also possible that *A. semiaurea* is a hybrid between *A. euthycarpa* (wide-phyllode variant) and *A. argyrophylla*; specimens of this putative hybrid are lodged in the State Herbarium of South Australia (AD). Further study of *A. semiaurea* is needed to resolve its taxonomic status.

Ethnobotany

A. retinodes was mentioned in the diary of Wilkinson (1848), as "*A. affinis*" or "Silver Wattle", and together with *A. pycnantha*, called "Wattle", was noted as being "esteemed for their bark, which is used in tanning, and for the gum that exudes from them plentifully in hot weather". The export of gum became an early commercial enterprise in Adelaide. Wilkinson also noted

that "The natives roast the gum in the fire, and then eat it, seemingly with a great relish, and I suppose it is very nutritious. They were quite astonished when first they saw the white men collecting it all over the country, and feared that when it was all gone they would starve".

Fitzpatrick (1991) listed the Kaurna name "telleelya" for *A. saligna*, a Western Australian species, this name possibly refers to the superficially similar looking *A. retinodes*.

Utilisation

A. retinodes is rarely cultivated although there has recently been limited use of it in revegetation plantings in the Adelaide Hills. Maslin & McDonald (2004) noted that *A. retinodes* has good prospects for future cultivation and development, for wood, tannin, fodder, seed and gum products.

Etymology

The specific epithet is from Greek for resinous, in reference to the gum yielding properties. Behr communicated information to Schlechtendal concerning the gum yielding properties of this species, as noted in the original description.

Stapf & Ballard (1929) and Black (1924) used the specific name *rhetinodes* reflecting the correct Greek spelling. However *retinodes*, the spelling Schlechtendal used in the protologue, has remained in common usage and, as the original spelling, is here retained.

Common names

Silver wattle, *wirilda*. Behr recorded that the common name "Silver Wattle" was in use in the 1840s, together with "Willow", by the German colonists. Today, "Silver Wattle" is a common name that is used for several other *Acacia* species, so would be a confusing name for *A. retinodes*. "Hills Wirilda" is suggested as a possible common name.

Selected specimens examined. (ca 90 specimens total).

SOUTH AUSTRALIA: Morialta Gully, 7 Feb. 1922, *J.M. Black s.n.* (AD96728025); Normanville, 17 Jan. 1924, *J.B. Cleland s.n.* (AD96418265); c. 16 km SW of Eudunda, *B. Copley 3300* (AD, MEL; n.v. L, LE, M); NE of Tanunda, *D.N. Kraehenbuehl 1848* (AD; n.v. L, NY, PRE, W); Tarnma Creek, Tothill Range, *D.N. Kraehenbuehl 5386* (AD); Ca 2 km due NNE of Normanville Fleuriu Peninsula, *B.R. Maslin 8355* (AD; n.v. PERTH, CANB); 0.3 km NW of Bull Creek hamlet on the Meadows - Ashbourne road, *B.R. Maslin 8358* (AD; n.v. PERTH, CANB); Torrens River, 1847, *F. Mueller s.n.* (right hand side of MEL2082778); Onkaparinga River, 1848, *F. Mueller s.n.* (MEL2082753); Kaiser Stuhl Conservation Park, *D.E. Murefet 912* (AD); Cape Jarvis to Delamere Rd., 2 km SW of Delamere, *M.C. O'Leary 2641* (AD); Mt Bryan, *M.C. O'Leary 2729* (AD); Mt Barker-Wistow Rd., *N.M. Smith 2637* (AD; n.v. PRE, PTBG); Anstey Hill Recreation Park, *A.G. Spooner 10577* (AD); Mt. Bold hillsides, *J.G.O. Tepper 364* (bottom centre of AD96920224D); Angaston, 3/1/1882, *J.G.O. Tepper 502/363* (bottom left hand side of AD9692022C); Rockleigh, *D.J.E. Whibley 5654* (AD); Carrickalinga, near sand work, *D.J.E. Whibley 9987* (AD).

2. *Acacia uncifolia* (J.M.Black) O'Leary, *comb. et stat. nov.*

Acacia retinodes var. *uncifolia* J.M.Black, Trans. Proc. Roy. Soc. S. Austral. 56: 42 (1932), (*as rhetinodes*), **basionym**. J.M.Black, Fl. S. Austral. 2: 411 (1948); Willis, Handb. Pl. Victoria. 2: 227 (1973, as 1972); Whibley, *Acacias S. Australia*. 112 (1980); Costermans, *Native Trees & Shrubs SE Australia* 319 (1981); Elliot & Jones, *Encycl. Austral. Pl.* 2: 106 (1982), partly; Bernhardt et al. *Ann. Miss. Bot. Gdn.* 71: 17 (1984); Whibley, *Fl. S. Austral.* 2: 555-556 (1986); Simmons, *Acacias Australia* 2: 176 (1988); Prescott, *Its Blue With Five Petals*. 90 (1988), partly; Knox et al., *Austral. J. Bot.* 37: 104 (1989); Whibley & Symon, *Acacias S. Australia* 142 (1992); Lynch, *Conservation Biology. Management. of 16 Threatened. Fabaceae sp. Tasmania*. 42 (1993); Entwisle et al., *Fl. Victoria*. 3: 637 (1996); Prescott, *Its Blue With Five Petals Kangaroo Is.* 150 (1995); Maslin et al., *Edible wattle seeds southern Australia*. 42 (1998); Maslin, *Fl. Austral.* 11A: 281-283 (2001b); Maslin, (coord.) *WATTLE Acacias Australia*. (2001a); Ross & Walsh, *Census Vascular Pl. Victoria* 7: 92 & 126 (2003); Maslin & McDonald, *AcaciaSearch - Evaluation Acacia woody crop southern Australia* 186 (2004) — **Type citation**: "Waitpinga Road, near Encounter Bay." — *Racosperma retinodes* var. *uncifolium* (J.M.Black) Pedley, *Austrobaileya* 6(3): 489 (2003). Holotype: *J.B. Cleland*, [South Australia, 25 Jan. 1932.]; AD; isotype: AD, K.

Acacia retinodes auct. non Schldl.: Mueller, *J. Linn. Soc.* 3: 126 (1859), partly; Benth, *Fl. Austral.* 2: 362-363 (1864), partly; Benth, *Trans. Linn. Soc.* 30: 468 (1875), partly; Mueller, *Syst. Census Austral. Pl.* 1: 44 (1882), partly; Tate, *Trans. Proc. Roy. Soc. S. Austral.* 6: 139, 155 (1883), partly; Black, *Fl. S. Austral.* 2: 277 (1924), partly; Stapf & Ballard, 153: t. 9177, *Bot. Mag.* (1929), partly; Curtis & Morris, *Students Fl. Tasmania*. 128 (1975); Gailbraith, *Victorian Nat.* 77: 73 (1960), partly; Boomsma, *Native Trees S. Australia*. 75 (1981), partly; Prescott, *Its Blue With Five Petals*. 90 (1988), partly.

Illustrations and photographs

Whibley (1980), 113, Fig B; Costermans (1981), 319, Fig b; Whibley (1986), 2: 557, Fig 288 (single phyllode, right hand side); Simmons (1988), 2: 177, (small central phyllodes); Prescott (1988), 90, Fig 2 (left hand side 'coastal'); Whibley & Symon (1992), 143, Fig B; Lynch (1993), 42, (small central phyllodes); Prescott (1995), 151 (top centre 'coastal'); Entwisle et al. (1996), 3: 636, Fig i; Maslin et al. (1998), 44 & 45, (photographs, and upper central Fig (excluding lower left hand side); Maslin (2001b), 11A: 280, Fig J; Maslin (2001a), (*as A. retinodes* var. *uncifolia*); Maslin & McDonald (2004), 187 (photographs).

Large rounded *shrub* to small *tree*, 5–10 m tall, *stems* twisted, single stemmed or with several main stems from near ground level, crowns bushy, limited suckering present. *Branchlets* reddish, angular at first but soon terete, glabrous, marked with rather prominent raised leaf bases where phyllodes have fallen. *Bark* smooth, becoming longitudinally fissured with age, grey to dark brown. *New shoots* glabrous, not pruinose. *Stipules* shallowly triangular, with wide central rib (rarely 3) and thickened base, often with a dark resinous coating, 0.7–1.3 mm long, fringed with short white to red/brown hairs. *Phyllodes* oblanceolate to narrowly oblanceolate, rather abruptly narrowed at

apex into a delicate recurved-uncinate point, (25–) 30–75 (–80) mm long, (2–) 3–10 (–15) mm wide, ascending to spreading, straight or shallowly recurved, glabrous, green to grey-green, crowded on stems, 4–10 mm apart; *midrib* central to slightly eccentric, not pronounced; *lateral nerves* inconspicuous, *marginal nerves* narrow, yellow to light brown when dry; *gland* single on upper margin of phyllode 0–8 mm above pulvinus. *Inflorescences* 1 per node, racemose, fragrant, *racemes* 20–40 (–50) mm long, with 5–10 (–12) heads; *peduncles* 2–5 mm long, slender, glabrous, yellowish or brown when dry; *heads* globular,

8 mm diam. (when fresh, drying 4–5 mm diam.), (16–) 18–30 (–32) flowered, cream to pale yellow. *Flowers* 5-merous; *sepals* clearly united, $\frac{1}{3}$ – $\frac{1}{2}$ petal length, obtusely 5 lobed, oblong-ob lanceolate to spatulate, fringed with silver-golden hairs; *petals* 1.7 mm long, easily separating, glabrous, but thickened and papillose at summit. Ovary covered with scattered to dense short white hairs. *Pods* linear, often slightly constricted between the seeds, with occasional random deep constrictions, to 160 mm long, 5–7 (–8) mm wide, firmly chartaceous, straight to slightly curved, glabrous. *Seeds* longitudinal in pods, oblong to



Fig. 3. *Acacia uncifolia*. A – Flowering branch with mature phyllodes. B – D – Phyllodes showing range of variation. E – Bark. F – Unopened inflorescence. G – Opened inflorescence. H – Bract and sepal. I – Flower showing bract, fused sepals, petals and stamens. J – Bract. K – Petals showing thickened glandular lobes. L – Sepals. M – Hairy Ovary. N – Pods showing longitudinal seeds. O – Seed showing terminal, aril and funicle encircling in double fold. P – Seed in plain view showing pleurogram (left) and side view (right). (A from Alcock 3945; B from Fagg 395 (left hand phyllode); C from Whibley 10173 (central phyllode); D from Lothian 1260 (right hand phyllode); E from O’Leary 2368; F – L from Alcock 3945; M – O from Bates AD99318155). A & D x1; B x1/2; C x18; E x8; F x7; G & H x27; I, J & K x56; L x2; M x6; N–Q x9.

oblong-elliptic, 4–6 mm long, dull to slightly shiny, dark brown to black; funicle $\frac{3}{4}$ or more encircling seed in double fold, reddish brown to blackish; aril white, clavate. Fig. 3.

Distribution (Fig. 4).

A. uncifolia has a disjunct distribution in coastal and near coastal areas of south-eastern Australia, from Kangaroo Island and the southern Fleurieu Peninsula in South Australia, Point Impossible near Torquay to Wilsons Promontory in Victoria, and King and Flinders Islands in Bass Strait, Tasmania. The distribution is mapped by Maslin (2001a), and Maslin & McDonald (2004), but their records of *A. uncifolia* on the southern Eyre Peninsula are now known to represent *A. alcockii*.

Habitat

Occurs in coastal habitats, on dunes and sandy soils over limestone. Associated species include *Banksia integrifolia*, *Eucalyptus diversifolia*, *E. globulus*, *E. rugosa*, *Melaleuca lanceolata*, *Allocasuarina verticillata*, *Acacia longifolia* subsp. *sophorae*, *A. cupularis*, *A. triquetra*, *Adriana quadripartita*, *Beyeria lechenaultii*, *Olearia axillaris*, *Leucopogon parviflorus*, and *Leptospermum laevigatum*.

Conservation status

Populations of *A. uncifolia* are well conserved in South Australia in the Newland Head Conservation Park on Fleurieu Peninsula, Cape Gantheaume Conservation Park, Kelly Hill Caves Conservation Park and Flinders Chase National Park on Kangaroo Island. Those in Victoria are conserved in the Point Nepean and Wilsons Promontory National Parks, while those on Flinders Island are reserved in the Wybalenna Historic Site and several small coastal reserves. This species is given a rare status in Tasmania under the Threatened Species Protection Act, Lynch (1993) (Threatened Flora of Tasmania 2006). This publication and website record the occurrence of *A. uncifolia* for only Flinders Island, however a small population of this species is now known to occur on King Island.

Flowering and fruiting period

Flowering is reported by Maslin & McDonald (2004), to be variable over its discontinuous distribution. Peaks in flowering for South Australia have been recorded from October to December (Whibley & Symon 1992), and November to January for Kangaroo Island (Jackson

1988), December to February in Victoria (Bernhardt et al. 1984), and December to April in Tasmania (Lynch 1993). However, sporadic flowering occurs in all populations throughout the year. Legumes with mature seeds have been collected from December to January, and develop over winter from the previous seasons flowers.

Variation

There appears to be little significant variation between the disjunct populations of *A. uncifolia*, although Maslin & McDonald (2004) noted that plants from Cape Schanck in Victoria are taller and possessed straighter stems than those from Waitpinga Beach in South Australia. The extensive areas of natural vegetation on Kangaroo Island and populations of *A. uncifolia* that occur there enable a more comprehensive understanding of the natural variation within this species. Plants growing on deeper sands in sheltered locations can form trees 5–10 m tall, and often tend to have longer narrower phyllodes, while plants in exposed locations on shallow sand grow as dense shrubs with shorter leathery phyllodes. This phyllode variation is illustrated in Fig. 3 (B, C, & D).

Affinities

A. uncifolia is closely related to *A. retinodes*, and was until recently treated as a variety of that species. However, significant differences exist between these two taxa and these justify recognition of them as distinct species.

A. uncifolia superficially resembles some specimens of *A. alcockii*, and until recently occurrences attributed to *A. uncifolia* on lower Eyre Peninsula were misidentifications of *A. alcockii*. However, its larger number of flowers per head, wider phyllodes, and pods with seeds transversely aligned distinguish *A. alcockii* from *A. uncifolia*. Phyllodes of *A. uncifolia* may also resemble some specimens of *A. euthycarpa*, and *A. flocktoniae* Maslin & McDonald (2004) and although these two species are in the same general group as *A. uncifolia* they are not especially closely related to the new species.

Hybrids

No specimens of *A. uncifolia* are known to show any morphological evidence of hybridity. The population of *A. retinodes* from Carrickalinga (Normanville Beach), south of Adelaide, discussed in Maslin & McDonald (2004, as 'Normanville' variant) and previously postulated to be a stable hybrid with *A. uncifolia*, is now considered to be a coastal form of *A. retinodes* (see discussion above).

Etymology

The specific epithet is derived from Latin, *unci-folia*, and refers to the characteristically hooked mucro found on the phyllodes.

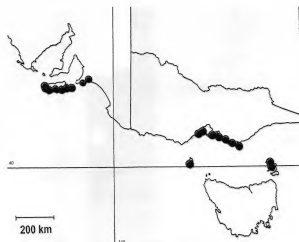


Fig. 4. Distribution map of *Acacia uncifolia*.

Common names

Summer wattle (Jackson 1988), *wirilda*. “Coast Wirilda” or “Coastal Wirilda” is suggested as possible common names for this species.

Selected specimens examined. (ca 110 specimens total).

SOUTH AUSTRALIA: Flinders Chase, C.R. Alcock 10733 (AD); Cape Borda Cemetery, P. Canty 10076 (AD); Waitpinga, Encounter Bay, Feb. 1924, J.B. Cleland s.n. (AD97413383); Rocky River, away from water, 7 Dec. 1934, J.B. Cleland s.n. (AD96728029); Hog Bay, 1918, E.H. Ising s.n. (AD97324155); at the top of Mt Thisby, G. Jackson 473 (AD); Waitpinga Beach, 1 km inland, B.R. Maslin 6005 (AD); road into Hanson Bay, M.C. O’Leary 1937 (AD); D’Estrees Bay, Point Tinline, M.C. O’Leary 2368 (AD); roadside between Parson’s Beach and Willow Creek, A.G. Spooner 7672 (AD); Kangaroo Island, in the swales between dunes at Pennington Bay, D.E. Symon 8488 (AD); scrub, Mt Tisbet, [sic] 13 Mar. 1884, J.G.O. Tepper s.n. (AD97303206); Waitpinga, behind dunes, D.J.E. Whibley 9988 (AD).

VICTORIA: Wilsons Promontory National Park, A.C. Beuglehole 75169 & J.G. Eichler (MEL); Point Lonsdale, B.G. Dangerfield 3 (AD); Cape Schanck area, c. 14 km due W of Flinders, B.R. Maslin 5473A (AD, MEL; n.v. CANB, PERTH); Barwon Heads, Jan. 1913 A. Purnell s.n. (AD98814118); Mornington Peninsula, Rye, junction of Cain Rd. and Molloy St. J.H. Ross 2529 (AD, MEL).

TASMANIA: Currie, King Is., 28 Jan. 1971, P. Barnett s.n. (MEL103738); edge of Camp Creek, Currie, King Is., Mar. 2006, M. & G. Batey 4 (AD); Cave Beach, Wybalenna, Flinders Island, P.J. Cullen s.n., 22 Sep. 1990 (AD99128374; n.v. HO).

3. Acacia provincialis A. Camus

Bull. Soc. Dendrol. France 64: 68-69, (1927). **Type citation:** “Var: Pampelonne, commune de Ramatuelle.” **Lectotype (here selected by B.R. Maslin, pers. comm.):** *A. Camus* s.n., Mar. 1927, cultivated at Var, Pampelonne, commune de Ramatuelle; P n.v. (photo: PERTH 06315410).

- A. retinodes* var. *floribunda* H.Vilm., J. Roy. Hort. Soc. ser. 2, 16: 84, fig. 2 (1894), nom. inval. (name not accepted by the author in text on p. 85); fide O.Stapf & F.Ballard ser. 2, Bot. Mag. 153: t. 9177 (1929) and B.R.Maslin Fl. Aust. 11B: 378 (2001).
- A. floribunda* Hort. ex G. Nicholson, Ill. Dict. Gard., Cent. Suppl. 4 (1900), pro syn. sub *A. retinodes*, non *A. floribunda* (Vent.) Willd. (1806).
- A. fragrans* Hort. ex Pottier, Jardin 22: t. 72, fig. 2 (1908), nom. nud., non Ten. (1845): fide O.Stapf & F.Ballard, loc. cit.
- A. semperflorens* Hort. ex A. Berger, Hort. Mortol. 7 (1912), pro syn. sub *A. retinodes*.
- A. longissima* Hort. ex Chopinet, Ann. Inst. Natl. Rech. Agron., Ser. B, Ann. Amelior. Pl. 1 (4): 603 (1951), pro syn. sub *A. retinodes*, non *A. longissima* Hort. ex H.L.Wendl. (1820).
- A. retinodes* Schldtl. var. *retinodes* “Swamp Wattle” in Maslin, Fl. Aust. 11A: 280 (2001).
- A. retinodes* Schldtl. var. *retinodes* “swamp variant” in Maslin, WATTLE Ac. Australia. (2001)
- A. retinodes* Schldtl. var. *retinodes* “swamp variant” in Maslin & M.W. McDonald, AcaciaSearch – Eval. Ac. 176 (2004).
- A. sp. Swamp* (N.M.Smith 3022) O’Leary in W.R.Barker et al., Cens. S. Austral. Vasc. Pl. 5th Edn, 67 (2005).

A. retinodes auct. non Schldtl.: Mueller, J. Linn. Soc. 3: 126 (1859), partly, excluding pod description which is *A. provincialis*; Benth., Fl. Austral. 2: 362-363 (1864), partly; Benth., Trans. Linn. Soc. 30: 468 (1875), partly, excluding pod description which is *A. provincialis*; Mueller, Syst. Census Austral. Pl. 1: 44 (1882), partly; Tate, Trans. Proc. Roy. Soc. S. Austral. 6: 138, 155 (1883), partly; G. Nicholson, Ill. Dict. Gard., Cent. Suppl. 4 (1900), partly; A. Berger, Hort. Mortol. 7 (1912), partly; Rock, Leguminous Pl. Hawaii. 23 (1920); Black, Fl. S. Austral. 2: 277 (1924), partly; Adamson & Osborn, Trans. Proc. Roy. Soc. S. Austral. 48: 108, 120, 122, 137. (1924), partly; Stapf & Ballard 153: t. 9177, Bot. Mag. (1929), partly; Black, Fl. S. Austral. edn 2: 411 (1948), partly; Chopinet, Ann. Inst. Natl. Rech. Agron., Ser. B, Ann. Amelior. Pl. 1 (4): 603 (1951); Gailbraith, Victorian Nat. 77: 73 (1960), partly; Willis, Handb. Pl. Victoria. 2: 227 (1973, as 1972), partly; Whibley, Acacias S. Australia. 112 (1980), partly; Polunin, Flowers. Greece & Balkans. 280 (1980); Boomsma, Native Trees S. Australia. 75 (1981), partly; Costermans, Native Trees & Shrubs SE Australia 319 (1981), partly; Elliot & Jones, Encycl. Austral. Pl. 2: 106 (1982), partly; Whibley, Fl. South Austral. 2: 555 (1986), partly; Prescott, Its Blue With Five Petals. 90 (1988), partly; Simmons, Acacias Australia 2: 176 (1988), partly; Dashorst & Jessop, Pl. Adelaide Plains Hills. 78 (1990), partly; Tame, Acacias SE Australia (1992), partly; Whibley & Symon, Acacias S. Australia 142 (1992), partly; Huxley et al. Roy. Hort. Soc. Dictionary. Gardening. 1: 16 (1992); Prescott, Its Blue With Five Petals Kangaroo Is. 150 (1995); Entwisle et al., Fl. Victoria. 3: 635, 637 (1996); Maslin et al., Edible wattle seeds southern Australia. 42, 45 (1998), partly; Maslin, Fl. Austral. 11A: 281 (2001), partly; Spencer, Horticultural. Fl. S. East. Australia. 3: 244 (2002); Ross & Walsh, Census Vascular Pl. Victoria. 7: 92, 126 (2003).

Illustrations and photographs

(All as *A. retinodes* unless otherwise named); De Mole (1861), pl. 13 (right hand side, as “Silver Wattle”); Mueller (1887), dec. 5 [pl. 9]; Vilmorin (1893), 14: 84, Fig. 2; Anon. (1919), ser. 3, 65: 163, Fig. 68; Campbell (1921), 51 (photograph); Stapf & Ballard (1929), 153: Tab. 9177 (excluding pod & seed, which is *A. neriifolia*); Black (1948), 2 411; Gailbraith (1960), 77: 73 (photograph); Boomsma (1981), 76 (left hand side); Whibley (1980), 113, Figs A, L, S; Costermans (1981), 319, Fig a; Elliot & Jones (1982), 2: 106 (photograph); Elliot (1984), 15, (lower right hand side), 18, (lower right hand side photograph); Whibley (1986), 2: 557, Fig 288A (excluding single phyllode, right hand side); Simmons (1988), 2: 177, (excluding small central phyllodes); Prescott (1988), 90, Fig 2 (right hand side); Dashorst & Jessop (1990), pl XXX11 Fig 9; Tame (1992), 134, Fig 141, pl. 141; Whibley & Symon (1992), 143 Figs A, L, S; McCann (1994), 80 (lower left hand side photograph); Prescott (1995), 151, Fig. 2; Entwisle et al. (1996), 3: 636, Fig h; Maslin et al. (1998), 44 (lower photograph), 45 (lower illustration); Maslin (2001b), 11A: 280, Fig G-I; Maslin (2001a), (as *A. retinodes* var. *retinodes* ‘swamp variant’); Spencer (2002), 244; Bonney (2003), 51; Maslin & McDonald (2004), 177 (photographs).

Slender, erect to medium-spreading tree, 5–10 m tall, trunk solitary, often dividing near ground level into several ascending stems, crowns open to bushy. Branchlets reddish-brown, often lightly (rarely strongly) pruinose, prominently flattened and angular, ribbed (often continuous below

phyllode) at first but soon terete, glabrous. *Bark* smooth, grey. *New shoots* glabrous, ribbed, often lightly pruinose. *Stipules* triangular, 1–1.2 mm, with a fine central rib that is often continuous with rib on the peduncle, fringed with fine white hairs. *Phyllodes* variable (corresponding to growth phase of plants, habitat and seasonal conditions), linear, erect, 100–200 mm long, 4–10 mm wide, (juvenile growth

phase); to oblanceolate, erect or spreading, 100–150 mm long, 15–25 (–35) mm wide, to narrowly oblanceolate or narrowly elliptic, erect to spreading, 90–140 mm long, 5–10 mm wide, (adult phase); straight or shallowly recurved, glabrous, blue-green to grey-green, glaucous, often lightly pruinose, uncrowded on stems, commonly 10–20 mm apart, *midrib* central to slightly offset; *lateral nerves*

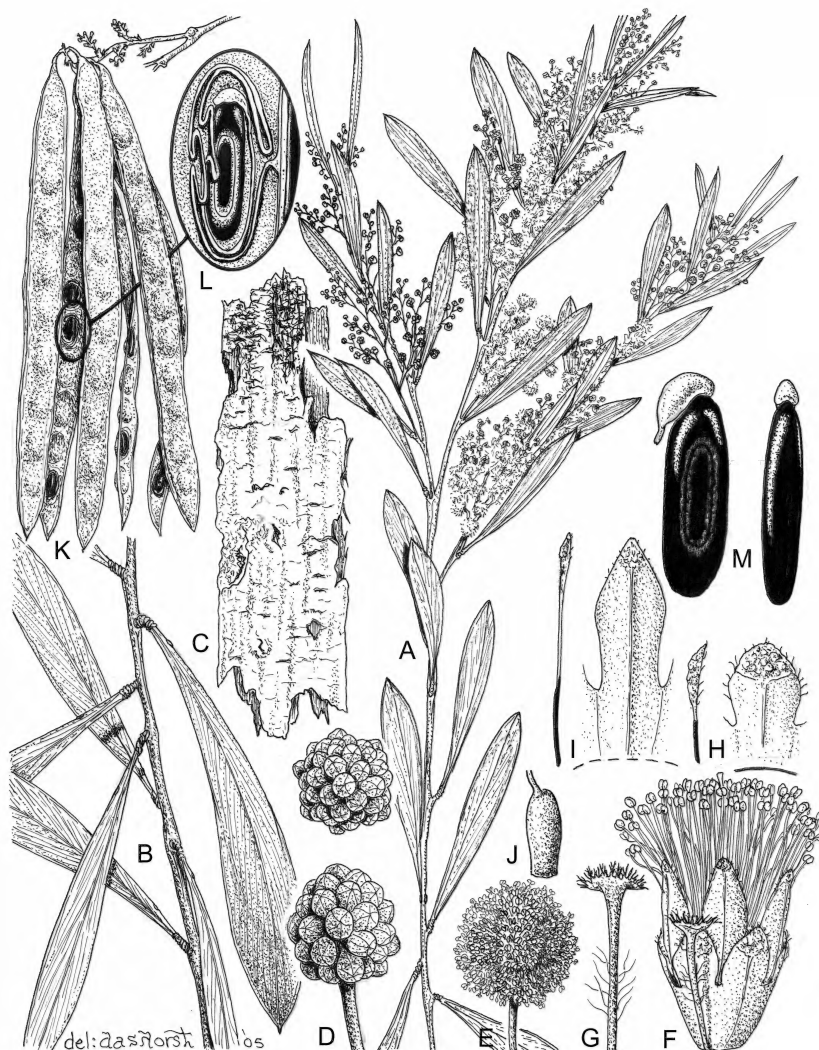


Fig. 5. *Acacia provincialis*. A – Flowering branch with mature phyllodes. B – Phyllodes, erect to spreading on branch. C – Bark. D – Unopened inflorescence. E – Opened inflorescence. F – Flower showing bract, sepals, petals and anthers. G – Bract. H – Sepal showing rib, thickened summit and fringing hairs. I – Petals showing central rib, terminal glands and papillose hairs. J – Glabrous ovary. K – Pods showing longitudinal seeds. L – Seed showing terminal aril and funicle encircling in double fold. M – Seed in plain view showing pleurogram (left) and side view (right). (A – K from O'Leary 1984, 2630, 2721 & 2723; K – M from O'Leary 2281. A&D x1; B x1/2; C x18; E x8; F x7; G&H x27; I, J&K x56; L x2; M x6; N–Q x9.

inconspicuous; *marginal nerves* narrow and yellow to light brown; *apices* straight to uncinat, with a delicate mucro; *gland* single, rarely 2–4, on upper margin of phyllode 0–16 mm above pulvinus. *Inflorescences* racemose 20–40 (–50) mm long, with 5–10 (–12) heads; *peduncles* (3–) 4–5 (–7) mm long, glabrous, yellowish or brown when dry; *heads* globular, 8 mm diam. (when fresh, drying 4–5 mm diam.), (18–) 30–50 (–54) flowered, golden to pale yellow. *Flowers* 5-merous; *sepals* clearly united, $\frac{1}{2}$ – $\frac{2}{3}$ petal length, 5-lobed, lobes thickened & ciliate, oblong-ob lanceolate to spatulate, with silver-golden hairs; *petals* 1.5–1.8 mm long, single nerved, glabrous, but thickened and papillose at summit. Ovary glabrous. *Pods* linear, to 160 mm long, 5–7 (–8) mm wide, firmly chartaceous to thinly crustaceous, glabrous. *Seeds* longitudinal in pods, oblong to oblong-elliptic, 4–6 mm long, dull to slightly shiny, dark brown to black; funicle $\frac{3}{4}$ or more encircling seed in double fold, reddish brown to blackish; *aril* clavate. Fig. 5.

Distribution (Fig. 7).

A. provincialis has a discontinuous distribution in southeastern Australia, from near Mt Crawford in the Mt Lofty Ranges, through the Fleurieu Peninsula and Kangaroo Island. It is absent from the Murray Basin and southeastern region of South Australia (apart from a single collection near the Victorian Border). The species is common in the Grampians and occurs along the Glenelg River in western Victoria, then eastward to near Melbourne. *A. provincialis* is used in revegetation and roadside plantings west of Melbourne, and seedlings from these plantings have been observed by the author in several locations, this together with the extensive clearance of the original vegetation, may obscure natural populations of *A. provincialis* in this area in the future. A recent collection from Currie, King Island requires further investigation to determine if it represents a natural population. A single specimen from Launceston in northern Tasmania (Hannaford MEL2081138) has a label in Mueller's handwriting questioning it as having been cultivated. The distribution of *A. provincialis* is mapped by Maslin (2001a), as var *retinodes* swamp variant, and Maslin & McDonald (2004, map 55).

Habitat

Occurs in damp soils along watercourses and freshwater swamps, spreading to moist valley slopes in high rainfall areas. Associated species include *Eucalyptus camaldulensis*, *E. leucoxylo*, *E. ovata*, *E. viminalis*, *Leptospermum lanigerum*, *L. continentale*,

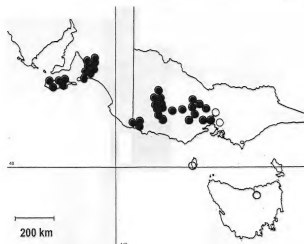


Fig. 7. Distribution map of *Acacia provincialis*. (○ = questionable occurrence).

Viminaria juncea, *Acacia melanoxylo*, *A. verticillata*, *Gahnia sieberiana*, *Blechnum minus*, *Phragmites australis*.

Conservation status

A. provincialis is well conserved in South Australia in parks in the Mt Lofty Ranges and Kangaroo Island, and in western Victoria in the Lower Glenelg and Grampians National Parks.

Flowering and fruiting period

Flowering peaks occur from September till January, with scattered flowering throughout the year. Flowering peaks appear to occur roughly 5–6 months after winter rains. April rains produce a peak in September to October, June rains producing a peak in December to January. Legumes with mature seeds have been collected from December to January.

Typification

A. provincialis was described in 1927 by Camus from cultivated material at Pampelonne, commune de Ramatuelle, in the south of France. Camus thought he was describing a hybrid between *A. retinodes* and *A. cyanophylla* (= *A. saligna*), after finding a single distinct plant growing amongst 30 year old plantings of these two species. It appears from the protologue that Camus considered the variable phyllode states to be a sign of hybridity; however this is a normal characteristic of this species in Australia related to environmental conditions and the biological age of the plant.

The lectotype specimen of *A. provincialis* at P consists of a mounted specimen (together with a loose specimen), and accompanying label,

Herbier E.G. Camus & A. Camus.
× *Acacia provincialis* A. Camus, Hyb. Sport.
(*A. cyanophylla* Lind. × *retinodes* Schl.)
Var. Pampelonne, commune de Ramatuelle
Mars 1927

together with a signature of A. Camus. The loose overlying specimen from the sheet represents an isolectotype. The three remaining type sheets of *A. provincialis* at P bear identical labels; they represent syntypes and are specimens of *A. saligna* and *A. pycnantha* (B.R. Maslin pers. comm.).

Camus's view that the phyllodes of *A. retinodes* should be erect, narrow and linear (normally a juvenile state for the species he was describing), could possibly relate to local climatic conditions, or a silvicultural response related to pruning (to regulate flowering times), or possibly cultivar selection.

The other possibility could be a familiarity with the protologue for *A. retinodes* and the description of linear phyllodes written by Schlechtendal. Without an examination of the type material housed at HAL, Camus probably was unaware that what had been called *A. retinodes* in France for the forty years of its cultivation was in fact another species.

Examination of the lectotype of *A. provincialis* shows no evidence of hybridity, or presence of the

characteristic plate glands or floral bracts of *A. saligna* (Maslin 2001b, and pers. comm.).

Variation

A. provincialis is a variable species whose appearance and morphology is influenced by the age of the plants and by habitat conditions. Habit can vary from erect slender trees in open wet swamps, to slender pendulous trees in shaded forests, or dense rounded trees to 10

metres tall in fertile soils alongside permanent water. Differing phyllode states often occur together on a single plant or branch, or conversely a plant may be dominated by one state (Fig. 6.). Specimens from Black Swamp south of Adelaide have erect linear phyllodes that appear to be a response to permanently waterlogged growing conditions, whereas plants 20 metres away on better-drained soil have more typical wider phyllodes. Plants from western Kangaroo Island growing on the

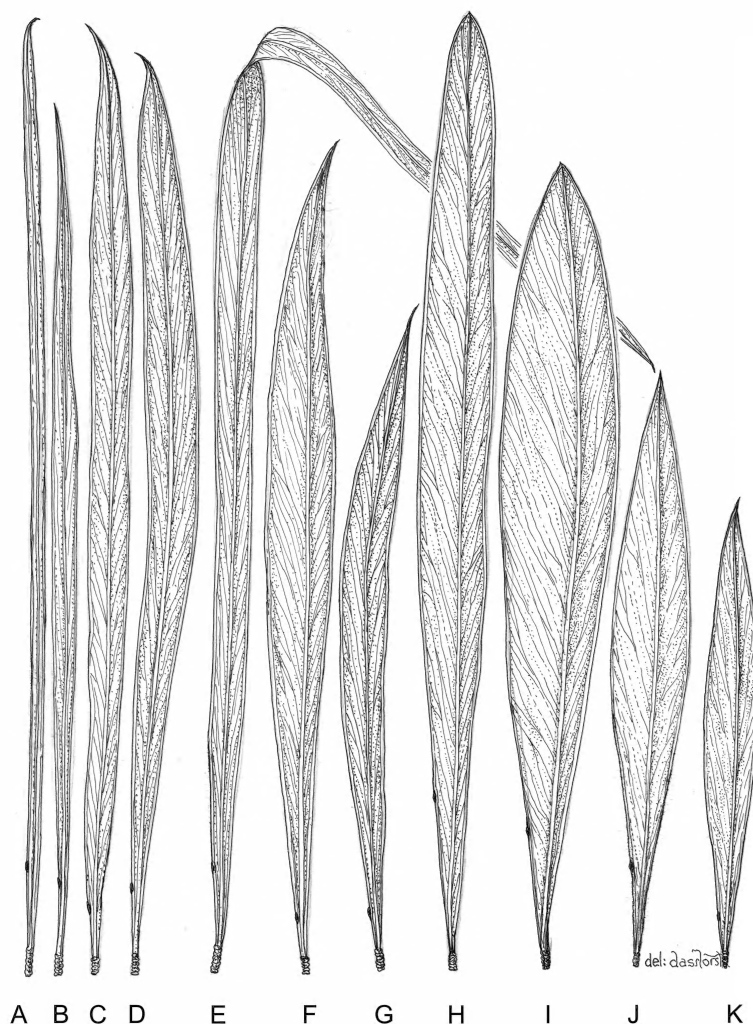


Fig. 6. Phyllode variation in *A. provincialis*. A – B – Juvenile phyllodes. C – I – Mature phyllode variation covering seasonal and habitat variation. J – K – Late maturity. (A composite from O'Leary 2722; B – D from O'Leary 4116; E from O'Leary 2723; F from O'Leary 1984; G from O'Leary 2281; H – I from O'Leary 2630; J from O'Leary 4116; K from O'Leary 1984. A – K (life size).

exposed lateritic plateau often possess wide leathery phyllodes, with strongly pruinose branchlets and pods. Phyllodes on plants elsewhere are normally thinly textured and often lightly pruinose. Occasional plants can be strongly glaucous, this appears to have occurred in France, with the selection of the “var glauca” cultivar, which is grafted for the cut flower trade.

Several collections from central Victoria, near Ballarat and Bendigo (Willis MEL1501102), (Beaglehole MEL2039795) and (Smith MEL572771), have pale yellow flowers with 18–20 flowers per head, and small glaucous phyllodes, which infrequently have more than one gland per phyllode. This variant may be worthy of further study, but this may prove difficult, as this area has been extensively cleared, and recent plantings of unknown provenance are becoming naturalised.

Affinities

A. provincialis is considered by Maslin (1995, 2001a, b), and Maslin & McDonald (2004) as being a South Australian member of the Australia wide ‘*A. microbotrya* group’, perhaps most closely related to *A. confluens*, *A. leiophylla*, *A. rivalis*, and *A. gillii*. Distinguishing characters between *A. provincialis*, *A. retinodes* and *A. uncifolia* are summarised in Table 1.

Hybrids

No hybrids involving *A. provincialis* have been seen by the author.

Ethnobotany

The name “Wirildar” was first recorded from the Ramindjeri Clan of the Narrinyeri People, from the southern Fleurieu Peninsula. This was a name for a gum-producing wattle tree. The “Ngaitye” or Totem of the Ramindjeri was “Wattle gum” Taplin (1879). Several other similar words from the Ramindjeri language have been recorded, including: “wurrulde”, for *Acacia* or wattle tree (Meyer 1843), and “wuruldi” for golden wattle totem (Tindale 1934–37), (P. Clarke, pers. comm. Sept. 2006). Clarke also notes that the word “wirilda” was almost solely used by non-Aboriginal people by the 1980s (P. Clarke, in prep.).

The “country” of the Ramindjeri occurs from near the present town of Victor Harbor to near Cape Jervis. In this area *A. provincialis* is relatively common, and was probably abundant along the numerous creeks, rivers and valleys. *A. uncifolia* is locally common near Waitpinga Beach, while *A. retinodes* appears to have been rare or absent, though it occurs nearby. *A. pycnantha* is the other gum-producing species from this area, but it was normally distinguished by early settlers, and known as “wattle”. Further study would be required to determine how specifically this name was applied to these species.

Utilization

A. provincialis is sold in Australian nurseries as a quick growing, long flowering small tree with edible

seed. It is often used in revegetation projects, but because it has been confused with *A. retinodes* and *A. uncifolia*, plantings have been made in inappropriate sites with habitats that better suit these other species. This has resulted in the underperformance of plantings, or the unintentional introduction of non local species to an area. Some publications note that this species is resistant to saline conditions, but these references may in part relate to the coastal species *A. uncifolia*. Interestingly, Wallace (1986) found *A. retinodes* (presumably referring to *A. provincialis*) to be resistant to salinity due to its ability to withstand waterlogging.

Although sold as *A. retinodes*, *A. provincialis* has been an important component of the cut flower industry in Europe for more than one hundred years (see Vilmorin 1894, Stapf & Ballard 1929, Sedgley et al. 2006). Today the species is sold in numerous nurseries around the world as a cut flower and potted plant.

Etymology

The specific epithet *provincialis* relates to the description from cultivated specimens grown in France from the Provence Region.

Common Names

Wirilda, *wirrildar*, *swamp wattle*, *water wattle*, *perennial wattle*, *ever flowering wattle*, *ever blooming wattle*, *bold wattle*, *mimosa of four seasons*.

Selected specimens examined (ca 200 specimens total).

SOUTH AUSTRALIA: Rocky River, Flinders Chase, C.R. Alcock 10734 (AD); Black Swamp, 2 Mar. 1946, J.M. Black s.n. (AD96728008); Cox’s Scrub, B.C. Crisp 60 (AD; n.v. PERTH); Mylor, N.N. Donner 110 (AD); Kangaroo Island, Church Rd., 2 km W of West End Highway, D.J. Duval & M.K. Jones 52 (AD, CANB, K, STU); Waterfall Gully, H.J. Eichler 14589 (AD; n.v. CANB, P, PRE, NY); Callawonga Creek, 59 F.M. Hilton (AD); Comaun East, D.N. Kraehenbuehl 3142 (AD; n.v. MCT, F); Mount Lofty Range, southern boundary of Kyeema Conservation Park, B.R. Maslin 8354 (AD; n.v. PERTH); Torrens River, 1847, F. Mueller s.n. (left hand side of MEL2082778); Onkaparinga River & Brown Hill Creek, F. Mueller s.n. (MEL2082743); Flinders Chase, M.C. O’Leary 2595 (AD); Boat Harbor Creek, N.M. Smith 3022 (AD); Peters Creek Rd., adjacent to Kuitpo Forest, D. Symon 13716 (AD; n.v. AAU, BRI, F, MO); Yankalilla Creek, R. Taplin 471 (AD); Clarendon, 30 Dec. 1881, J.G.O. Tepper s.n. (top left hand side of AD9692022A); Karatta, near river only, 5 Mar. 1889, J.G.O. Tepper s.n. (AD96920214); Aldgate, D.J.E. Whibley 37 (AD; n.v. B, SI); Finniss R., D.J.E. Whibley 10435 (AD).

VICTORIA: foot of Mt. William along creek, R. Bates 14089. (AD); Grampians, near Silverband Falls, N.N. Donner 1976 (AD); Victoria Ra., L. Haegi 636 (AD, MEL; n.v. CANB, NSW, A, AAU, H, L, SI); Grampians, S.T. Parfett 13 (AD, MEL; n.v. NSW, PERTH); Yarroowie River, 3 km S of Ballarat CBD, V. Stajsic 3407 (AD, MEL; n.v. CANB); Victoria Valley near Halls Gap, Grampians, D.J.E. Whibley 3378 (AD); Banks of Glenelg R. at junction of Moleside Ck, 10 Nov. 1963, J.H. Willis s.n. (MEL1501100).

TASMANIA: Henry Street, edge of Camp Creek, Mar. 2006, M. & G. Batey 1 (AD; n.v. HO, MEL); Distillery Creek, Launceston, P. Hamford (MEL2081138).

Doubtful Name

Acacia semperflorens Jacques

Ann. Fl. Pomone 1837–38: 40 (1837); Courtois, Magasin d'horticulture 1: 12 (1833), pro syn. — *A. impressa* Lindl. [= *A. penninervis*]. **Type citation:** "Cultivated in 1830 at the home of M. Boursault": (specimen uncertain).

Later, Jacques (1847) did not include *A. semperflorens* in the *Manuel Des Plantes*, which described the species of *Acacia* in cultivation at that time,

Typification

In the protologue of *A. semperflorens* Jacques says that he saw the plant growing at the home of M. Boursault in 1830 (near Paris). No type has been located but there is a specimen in the Florence Herbarium (FI, photo seen), which possibly originates from the type plant. This is the lower specimen on Herbarium Webbium sheet N055426, and has the accompanying label; "*Acacia semperflorens* M. Boursault, N. Holl. Temp 5. 1828".

Identity

Salient characters of the the Boursault specimen are: phyllodes 75–100 mm long, 15–20 mm wide, acute; gland appears to be 10–20 mm above the pulvinus and seems to be connected to the midrib by a fine oblique nerve; inflorescence racemose; heads globular; peduncles 5–7 (?–10) mm long, rather slender, heads about 20 or more flowered (B.R. Maslin, pers. comm.).

While the identity of this specimen is uncertain (fide Maslin 2001c), the combination of the Boursault specimen characters, and most notably, the phyllodes that possess a vein running to the gland, are characters that are not found in *A. retinodes*, *A. provincialis* or *A. uncifolia*. The protologue of *A. semperflorens* describes the branches as "slightly angled" at the apex, while *A. retinodes*, *A. uncifolia* and *A. provincialis* are conspicuously angled at their branch apices.

Courtois (1833) gives the name *A. semperflorens* in synonymy under *A. impressa* Lindl. (= *A. penninervis*), four years before it was published (Maslin 2001c).

The characters described in the protologue of *A. semperflorens* can be found in forms of the species *A. penninervis* or *A. rubida*. While the epithet "sempreflorens" ("ever flowering") is poorly descriptive of these two species, the protologue for *A. semperflorens* indicates that flowering occurs only in "one part of the year". It is the view of the author that *A. semperflorens* is likely to refer to either of these species.

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